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ELECTRIC RAILWAY JOURNAL

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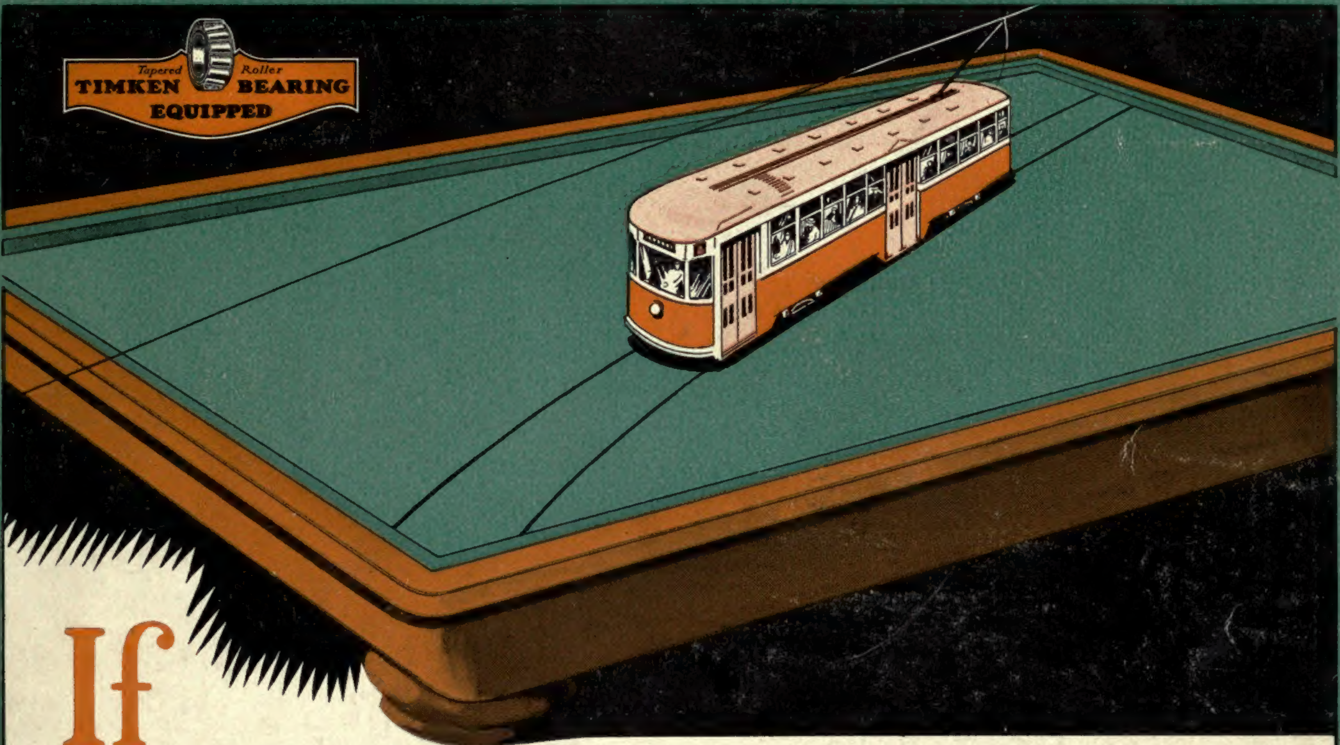

If your tracks were all as level as a billiard table

If your tracks could be made as level as the top of a billiard table, your operating costs would be much lower and running schedules easier to maintain.

Of course that is only a fantastic dream, but you can secure comparable results by equipping your car journals with Timken Roller Bearings.

And at the same time the riding comfort of your cars will be increased, bearing failure delays prevented, lubricant saved and maintenance expenses greatly reduced.

138 electric and steam railways are enjoying these and other Timken benefits. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* BEARINGS

MODERN TOOLS
of Transportation

The TROLLEY BUS
brings Increased Profits

This fact has been proved by the operation of Westinghouse-equipped Trolley Buses in Chicago, Brooklyn, New Orleans, Salt Lake City and Detroit.

Contributing largely to the success of the modern trolley bus, is dependable and efficient electrical equipment.

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- Better Commutation
- Forged Steel Fan Construction

CONTROL
- Smooth, Rapid Acceleration
- Quick Response
- Effective Notching
- Foot Operation
- Emergency Dynamic Braking

CURRENT COLLECTOR
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- Solid 15-Degree Crossing that will operate successfully with swivel harps
- Overlapping-runner Spring Frog
- Direct-connected Section Insulator bolted positively to frog or crossing

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

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TUNE IN THE WESTINGHOUSE PROGRAM OVER KDKA, KYW, WBZ AND ASSOCIATED N. B. C. STATIONS SUNDAY EVENINGS.

ELECTRIC RAILWAY JOURNAL

MORRIS BUCK
Engineering Editor
GEORGE J. MACMURRAY
CLIFFORD A. FAUST
J. W. MCCLOY
LOUIS F. STOLL
Publishing Director

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOSEPH R. STAUFFER
Chicago
PAUL WOOTON
Washington
W. C. HESTON
Pacific Coast Editor
ALEX MCCALLUM
London, England

Vol. 75, No. 5 JOHN A. MILLER, JR., *Editor* *Pages 233-284*

Interpreting Trends

RECOGNIZING the importance of analyzing trends revealed by company reports, the JOURNAL is presenting the figures of operating revenue, operating expenses and net income in a new form in this issue. In addition to the latest month's figures, monthly reports going back for a year are included, enabling a comparison of the corresponding month of the previous year with the latest report and a study of revenue, expense and net income trends through a full year. To subject the tabulation to quick and clear interpretation, per cent changes of all figures are calculated and included.

Study these reports—they tell accurately what is happening.

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1931

Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérêt local et de Transports Publics Automobiles.

NEW YORK, *District Office, 285 Madison Avenue*
WASHINGTON, *National Press Building*
CHICAGO, *520 North Michigan Avenue*
PHILADELPHIA, *1600 Arch Street*
CLEVELAND, *501 Guardian Building*
BOSTON, *1427 Statler Building*
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LONDON, *Aldwych House, Aldwych, London, W.C.2*

Published monthly, with one additional Convention Number during the year. $3 per year, 35 cents per copy. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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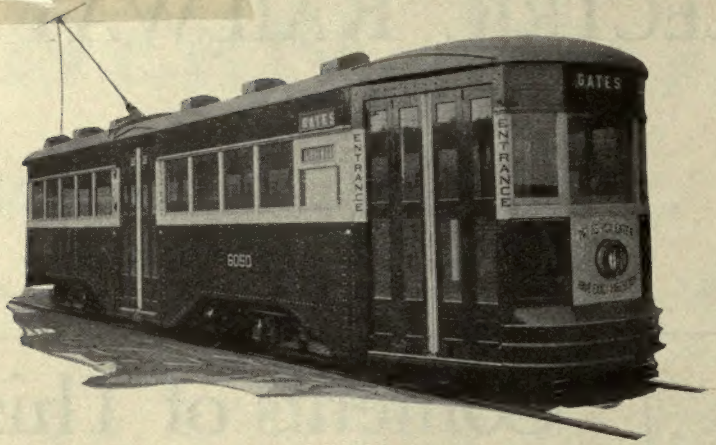


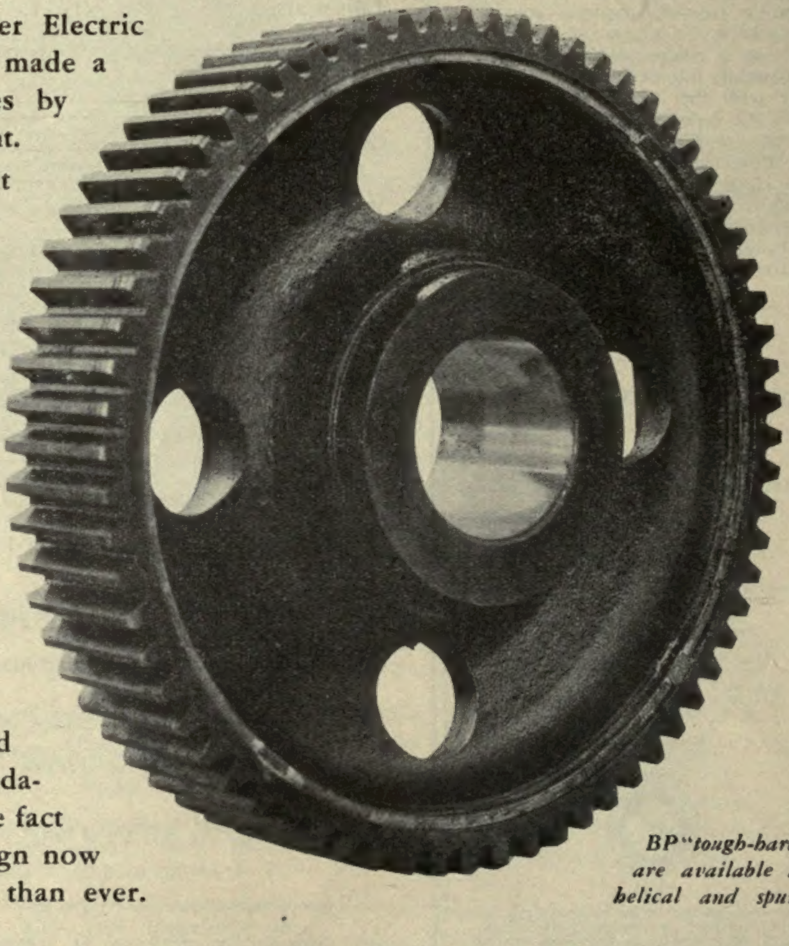
Many cars of the Brooklyn & Queens Railway are equipped with Westinghouse - Nuttall non-resonant BP "tough-hard" gears.

THEY'RE QUIETER - *NOW*

THE urgent desire for quieter Electric Railway operation is being made a reality today on many properties by the use of improved car equipment.

Sharing in this accomplishment on some 40 properties are non-resonant Westinghouse-Nuttall BP "tough-hard" gears. That these gears have contributed effectively to noise-abatement is indicated by the repeat orders from many of the original purchasers. An increasing number of new users affords further evidence of their effectiveness.

In this growing acceptance, other properties desiring quieter service have a strong recommendation for their use on new cars and for replacements. This recommendation is further strengthened by the fact that a recent improvement in design now makes these gears more effective than ever.



BP "tough-hard" gears are available in both helical and spur types.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

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TUNE IN THE WESTINGHOUSE PROGRAM OVER KDKA, KYW, WBZ AND ASSOCIATED N. B. C. STATIONS SUNDAY EVENINGS.

Good
BRAKES
make the
Trolley Bus
NIMBLE

The Trolley Bus fills an unique place in the transportation field, because of flexible operation, and is gaining popularity in many cities. Its ability to fully meet the peculiar conditions for which it seems fitted is assured by adequate brakes . . . Sixty-five trolley buses in Chicago have Westinghouse air brakes, including the light weight bungalow compressor made of aluminum, a self-lapping brake valve, and diaphragm brake chambers, with automatic slack adjusters, attached to the rear axle . . . These quick-acting, effective, reliable brakes are a great aid to lively bus movement—with safety.

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WESTINGHOUSE TRACTION BRAKES

Keystone Equipped Trolley Bus, built at American Plant of J. G. Brill Co.

HEADQUARTERS
for bus...trolley ...and trolley-bus equipment

Ever since the early days of electric railway operation Keystone Car Equipment has been specified for all types of cars. Now the trolley-bus is here and this thoroughly proved line of Keystone Equipment is ready to serve. Refer to catalog No. 7 for headlights, illuminated signs, passenger signal systems, interior lighting fixtures, gear cases, marker lights, trolley wheels, poles, catchers, trolley cord, etc., etc.

Catalog No. 7 is full of quality equipment for all types of cars and trolley-buses. Let us send you a copy.

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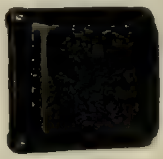

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Type T Lighting Fixtures

Type 129 Hunter Sign—mechanism

Get the right wheels and bricks

TO get the most from your rail grinders, get the right abrasives. Our whole business is rail grinding equipment. When we supply grinding wheels or blocks we know exactly what's best suited to the machine we designed and built for you. And we know rail—yours.

A wheel that's good for your neighbor may be all wrong for you. We know what's best for both of you. We have it—and can ship from stock immediately.

Buy your rail grinding wheels and bricks from the world's rail grinding equipment headquarters.

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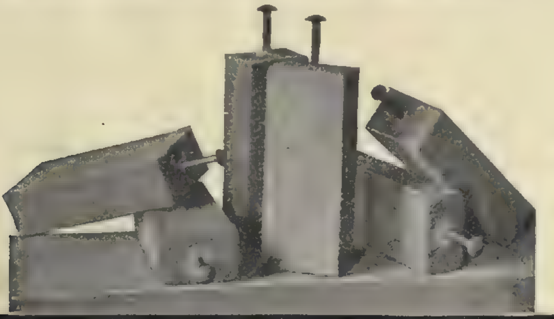

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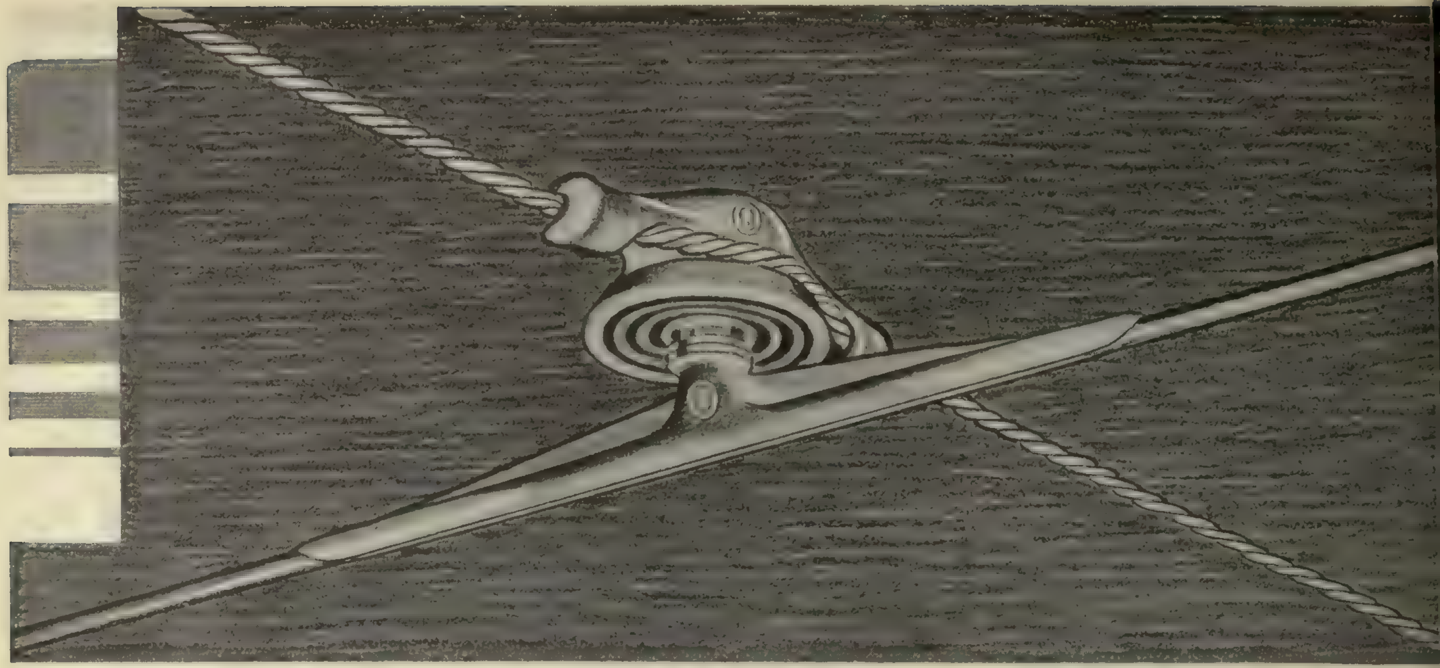


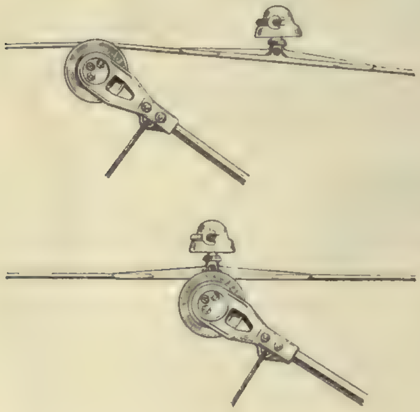
LOCALIZES, THEN ABSORBS the "HARD SPOT"

Overhead superintendents who recognize the importance of, and are sincerely searching for shock-free suspension assemblies will not stop with the adoption of Improved Marathon Ears. Although the Marathon Ear is quite generally accepted as providing the smoothest underrun and as being the most economical to use, it is equally well known that the most satisfying performance is enjoyed only when the hanger, too, is soft and shock-free.

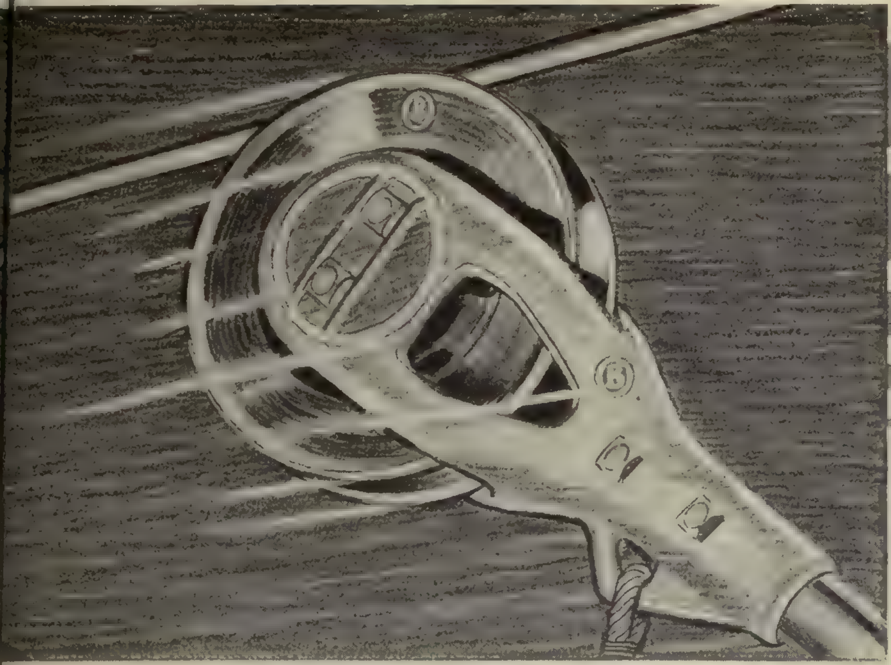
The O-B Spring-Lock Hanger functions in a manner that eliminates the hard spot of the suspension assembly. As the trolley wheel approaches or leaves, the hanger permits the ear to tilt upwards to form a straight line with the upthrusted wire, thus eliminating the bump between the yielding wire and the inflexible ear. The underrun at the boss section consequently becomes the pivoting point, and the tendency to bump is transferred from the ends to the center portion of the ear.

But even this bump is never allowed to develop in the Spring-Lock Hanger; for a steel spring, which is inserted between the hanger stud and the hanger body, absorbs the shock. Thus, the wheel rides the ear as firmly and as smoothly as it does the wire. Arcing is virtually abolished; hence pitting and wear are reduced to a minimum.

Those familiar with the excellence of the Marathon Ear will not be long in discovering the equally economical advantages of Spring-Lock Hangers. Others are urged to experience without delay the gratifying reductions in costs which follow the use of Marathon Ears and Spring-Lock Hangers.



Illustrating pivoting action of ear suspended from Spring-Lock Hanger as wheel approaches, and passes. The "hard spot" under boss of ear is absorbed by a spring cushion in the hanger.



GETTING TO THE BED-ROCK of CURRENT COLLECTION COSTS

Page 13 of New Products Supplement No. 4 gives a comprehensive description of Spring-Lock Hangers. Full details of O-B Trolley Wheels may be obtained by referring to page 106. Write for a copy.

Recent investigations reveal that substantial savings are effected in the costs of current collection equipment when old type trolley wheels are replaced with O-B Wheels. In addition to this saving, the general opinion is that wear on wire and overhead materials is also considerably reduced.

In reaching these conclusions, it was revealed that an O-B Wheel gives two to six times the mileage of other wheels; and that maintenance costs of O-B Wheels is negligible in comparison with the cost of lubricating and maintaining old type wheels. Reduction of wear on wire and overhead results because the O-B Wheel, with its large axle, permits a tension which insures a firm, continuous contact with the wire. This reduces burning and pitting, the primary causes of wear.

O-B Wheel axles outwear old style axles not only because of their larger area, but also because of their graphite lubrication. Graphite is an excellent conductor; hence, a constant, low-resistance path is provided between wheel and axle which eliminates much of the cause of axle pitting. Furthermore, a composition-graphite washer at each end of the wheel hub provides a direct path to the harp and relieves the axle of much of the current load. All of these exclusive features contribute to greater mileage, to higher efficiency, and to maximum economy of O-B Wheels.

Your O-B salesman will gladly co-operate in arriving at a better understanding of the advantages of O-B Wheel operation. Or, if you prefer to experience these advantages personally, a trial installation will gladly be arranged.

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Canadian Ohio Brass Company Limited, Niagara Falls, Canada
1400CL

Ohio Brass Co.
NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
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RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
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St. Louis Safety Council Approves One-Man Cars

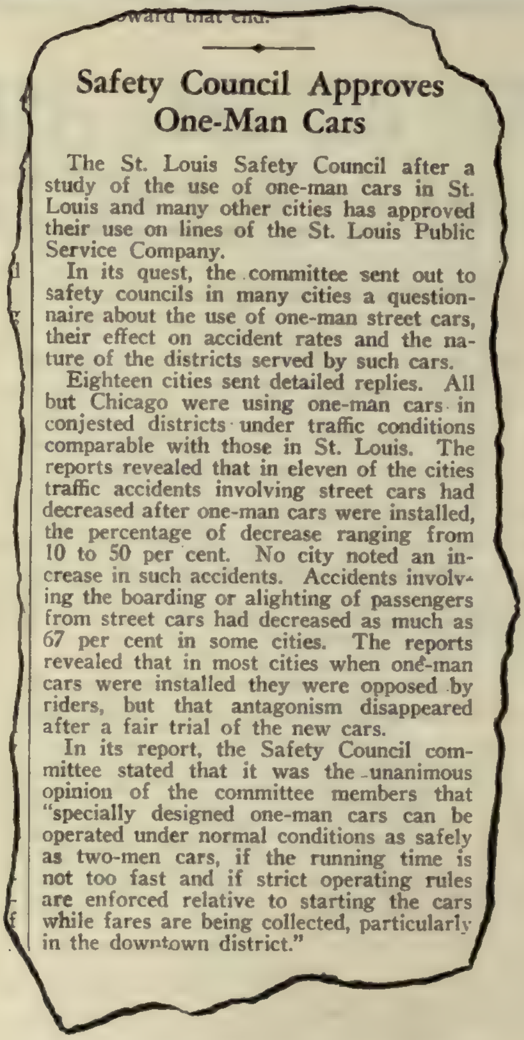
Pneumatic

Door

Control

Brings

Results



oward that end.

◆

Safety Council Approves One-Man Cars

The St. Louis Safety Council after a study of the use of one-man cars in St. Louis and many other cities has approved their use on lines of the St. Louis Public Service Company.

In its quest, the committee sent out to safety councils in many cities a questionnaire about the use of one-man street cars, their effect on accident rates and the nature of the districts served by such cars.

Eighteen cities sent detailed replies. All but Chicago were using one-man cars in conjested districts under traffic conditions comparable with those in St. Louis. The reports revealed that in eleven of the cities traffic accidents involving street cars had decreased after one-man cars were installed, the percentage of decrease ranging from 10 to 50 per cent. No city noted an increase in such accidents. Accidents involving the boarding or alighting of passengers from street cars had decreased as much as 67 per cent in some cities. The reports revealed that in most cities when one-man cars were installed they were opposed by riders, but that antagonism disappeared after a fair trial of the new cars.

In its report, the Safety Council committee stated that it was the unanimous opinion of the committee members that "specially designed one-man cars can be operated under normal conditions as safely as two-men cars, if the running time is not too fast and if strict operating rules are enforced relative to starting the cars while fares are being collected, particularly in the downtown district."

Less Accidents

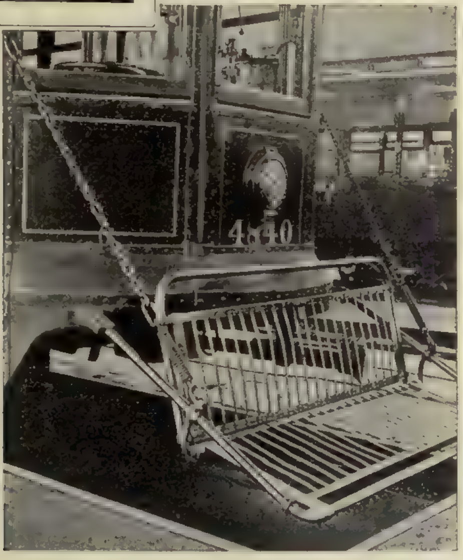
Faster Schedules

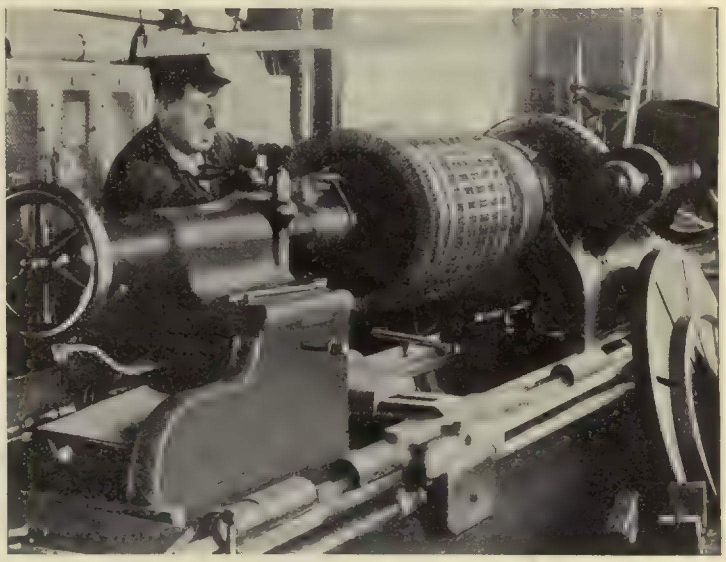
Lower Operating Costs

Reprinted from "Electric Railway Journal News"

NATIONAL PNEUMATIC COMPANY

When conditions *demand* GREATER PROTECTION for the SURFACE . . . .

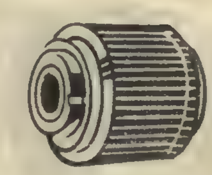


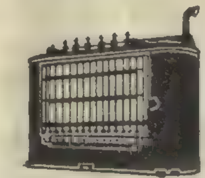


Electric Railways find many uses for G-E Glyptal. Highly resistant to heat, it protects with a hard, smooth, enduring film that adds useful life.

G-E Glyptal prevents rust—it will seal pipe lines or tanks from leakage. Protects motors and bearings from dirt and loss of oil. Economical—it can be applied by spraying, dipping or brushing. G-E Glyptal dries dust free in less than thirty minutes, sets in two hours and dries hard over night.

Possibly you have a problem which cannot be solved with ordinary materials. G-E Glyptal may prove adaptable to your needs. Talk over your problem with your nearest General Electric Merchandise Distributor or write Section M-315, Merchandise Department, Bridgeport, Connecticut.





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MERCHANDISE DEPARTMENT · GENERAL ELECTRIC COMPANY · BRIDGEPORT, CONNECTICUT

Service Records in Original Equipment

These G-E Pinions averaged 330,000 miles

THE high quality of General Electric pinions, together with carefully supervised maintenance methods, resulted in this phenomenal record of pinion mileage made by the Des Moines Railway Company. All of these pinions were standard G-E Grade M, long-addendum tooth form, meshed with standard G-E Grade M short-addendum gears, which are still in service.

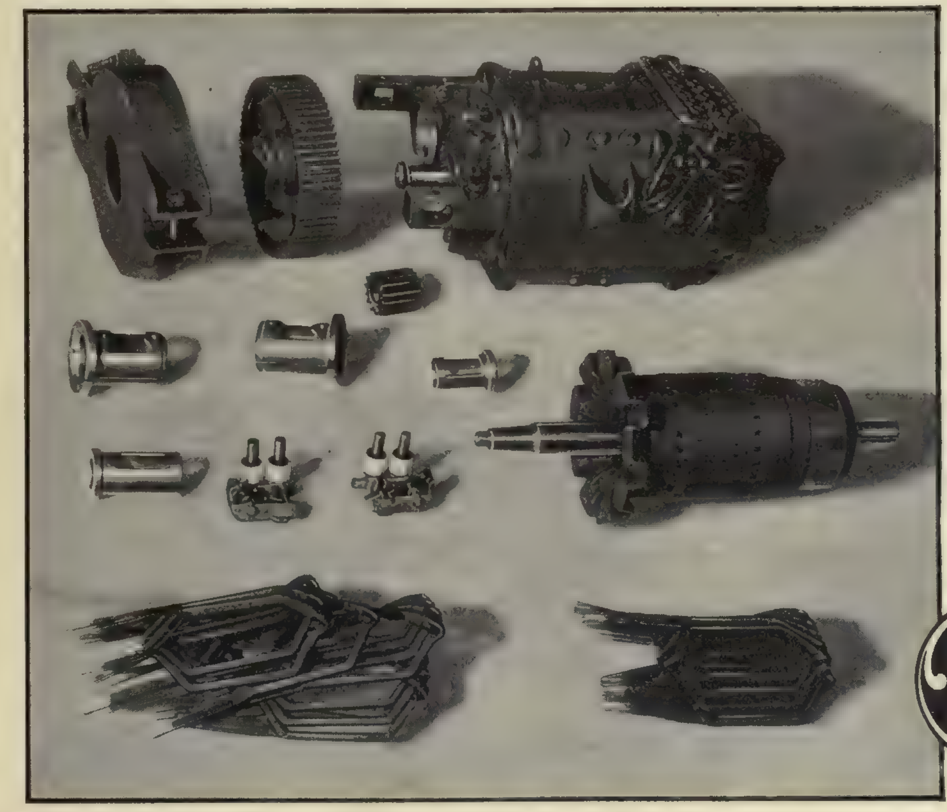
Pinion No.	Grade	Diametral Pitch	Miles
357	M	3½	207,318
367	M	3½	238,460
331	M	3½	278,642
342	M	3½	289,637
339	M	3½	290,213
325	M	3½	306,660
395	M	3½	323,129
297	M	3½	327,311
243	M	3½	355,338
154	M	3½	361.873
39	M	3½	369.029
198	M	3½	396,997
22	M	3½	436,635
26	M	3½	452,092
Average			330,952

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Prove G-E Quality and in Renewal Parts

You expect the utmost service from your General Electric equipment. The best assurance you can possibly have is to specify General Electric renewal parts; they are designed and manufactured especially for G-E apparatus. Each part is identical with the one it replaces and is matched for the same dependable performance. Gratifying results in the form of good economy and long life will be achieved by a policy that insists on G-E renewal parts for G-E equipment. The nearest G-E office is always ready to confer with you on your maintenance problems.



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330-164

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Why It Pays to Use
General Electric Renewal Parts
with General Electric Equipment

◆ ◆ ◆

THERE are two definite reasons why General Electric renewal parts for car equipment can help you reduce operating costs and improve service. First: whether the part required is an armature coil or a pinion, you may be certain that the highest quality is embodied in its design, materials, and construction. Second: General Electric renewal parts can be obtained quickly from any G-E warehouse. These are located at important centers of transportation throughout the United States.

General Electric renewal-parts stock rooms are modern department stores for the railway industry. It will pay you to take advantage of their services. Buy from a single source. It simplifies accounting and storekeeping. It insures original equipment quality.

◆ ◆ ◆

330-165

GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

New York,
May, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 5

Not Every New Idea Is a Panacea

IT IS only human nature to seek panaceas. Especially in an industry which has encountered as many difficulties as has local transportation, and one which has experienced a plunge from the serene security of monopoly into the scramble of competition, it is perhaps natural to hope for a panacea in every new idea that gives promise of solving certain baffling problems.

When the length of haul on street railways was increasing rapidly, and labor costs began to mount, there was a trend toward increased size and weight of cars. In an endeavor to carry more people in a single unit, train operation was adopted. Many managers then felt that this offered an almost universal solution of the problem of longer hauls and higher wages with fixed fares. But increasing the size of unit proved not to be a panacea. Increased weight raised power and track costs. Schedule speeds and headways suffered. Distinct limitations in large units became apparent.

Ultimately, there was a swing to the other extreme. Hordes of jitneys began to impair railway revenue. Their chief attractions seemed to be fast and frequent service. To meet this condition the small, one-man single-truck safety car was developed. For the purpose for which it was designed it proved successful. But in a short time, an excellent idea was again carried too far. Short headways, lightweight cars and one-man operation seemed to offer a combination that could be universally applied, and managements were importuned to replace all other types of equipment with the new unit. Although this new vehicle served an extremely useful purpose, and probably saved many properties from bankruptcy, its limitations soon began to be recognized.

Next the jitney grew into a bus, and began to improve in performance and reliability under the initiative and technical skill of its sponsors. Again it was natural that enthusiasts hailed the new vehicle as a universal solution for urban transportation problems. At one time, double-deck buses were advocated for widespread replacement of street cars in large cities. Subsequently, the 40-passenger single-deck bus was developed, and the replacement of all rail service was again freely predicted. But experience is proving that the bus, though widely useful, has distinct limitations.

Most recent among transportation vehicle innovations is the trolley bus. Though virtually abandoned a decade ago because of technical imperfections, it has subsequently been improved to a point that promises to make it an important new agency of transportation. Combining some of the best features of the trolley and the bus, it offers a number of definite advantages in the way of performance and economy. If wisely applied to the solution of specific problems within its range of usefulness, it will serve as a valuable new tool. But if it is looked upon as the long-sought panacea for making all transportation operation profitable, it will prove a costly disappointment.

▼

Transit Turmoil in Philadelphia

NAMING of receivers for the Philadelphia Rapid Transit Company has again focused nation-wide attention on the transportation situation in that city. This latest development comes as a result of the equity action brought by the city for an accounting and for the ousting of Mitten Management. The opinion by Judge McDevitt holds that virtually all of the charges of waste and extravagance made against Mitten Management and the P.R.T. have been proved, and not only directs the separation of Mitten Management from further relations with P.R.T. and its subsidiaries, but urges action by the receivers looking toward recovery of $8,000,000 alleged to have been misspent. No question of the company's solvency has been raised. In fact, the court specifically stated that the company is solvent, but the proceedings already have had a depressing effect upon the holdings of thousands of small investors and employees.

The present debacle is a far cry from 1910 when Mr. Mitten took over the management of the broken-down street railway system in Philadelphia. No one can deny that in the interim Mitten Management has raised the quality of transportation service to a high level. For its work in building up the property physically, for its accomplishment in maintaining satisfactory relations at all times with its men, for its many campaigns in the interest of safety and for the heed it has given to progressive ideas for service improvement, the management deserves the greatest credit.

Its endeavors to promote co-ordination of facilities have been in line with the most modern thinking. Entry into the field of taxicab operation was a step in this direction. In so far as the law may have blocked the efforts of the company to bring about effective co-ordination, the fault lies with the state. In so far as that end may have been sought by devious devices, however, the fault lies with the management.

Judge McDevitt's decision makes spicy reading, but on that very account seems rather inopportune, particularly in the light of the aroused state of public feeling on this subject. Reference by the court to "marionettes" and to "rubber-stamp officials" meets the demand for colorful writing but style in judicial opinions should be secondary to the substance.

From the findings of the court it appears that the Mitten objectives were well conceived but some of them were not so well achieved, and that difficulties arose when ideals degenerated into deals. So far, the court's remarks have been met in rejoinder only with the statement that nothing in the adjudication, even if sustained, would diminish the assets of P.R.T. To conclude that this is the best that the management can do in defense of its acts is to prejudge the case. It is evident, however, that there is much to be explained and if it is not explained satisfactorily the entire industry will suffer from the repercussions.

▼

The Street Car an Aid to Traffic Movement

BEAUTIFUL in its simplicity is the idea that the elimination of street cars will speed up the movement of traffic. If all the people who now ride the street cars would be content to remain quietly at home perhaps this happy result might be accomplished. But if they should stubbornly insist on going to work, going shopping, and going out to places of amusement, what means of transportation would they use? Obviously the proponents of this method of relieving traffic congestion expect them to use private automobiles. It is equally obvious, however, that the advocates of street car elimination have not considered how this would affect the traffic situation.

For example, let us consider conditions on a street with a movement of 5,000 persons per hour in one direction. Studies made in numerous cities show that approximately 3,500 of these people will be carried by street cars and 1,500 in private automobiles. To do this will require 70 street cars and 900 automobiles under ordinary conditions of loading. To carry the same total number of people by private automobiles alone would require 3,000 vehicles, or more than three times as many as are now using the street. This increase in the number of vehicles is vastly greater than could possibly be accommodated in the extra traffic lane gained by the elimination of street cars, so that congestion on the remaining roadway space would be very materially worse than it is at present.

That is the fatal defect in the theory. It is the obstacle which stands solidly in the way of increasing the speed of traffic movement by the elimination of street cars. It is the reason why traffic engineers have all come to the conclusion that the street car is indispensable. If the man who rides in his private automobile only knew it, the street car about which he growls and grumbles is really his best friend, for without it, congestion would be intolerable.

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Maintenance Men as Business Builders

"NEW cars, new track and faster schedules are always desirable, but what we need now is more customers, and this thought should take first place in our minds today." With this challenge the president of an equipment men's association recently closed a stirring address in which he urged all maintenance men to take an active part in building up business. There is no doubt that maintenance men are keenly interested in solving the difficulties now facing the railways and that they are in a position to contribute much valuable aid. With the constant pressure to reduce maintenance costs to a minimum, it would not be surprising if the efforts of this department were directed entirely to cutting expenses. It is particularly encouraging, however, to find maintenance men contributing also to the problem of securing more riders.

Of course, the primary way in which maintenance men can aid in selling transportation is by doing the best possible job in keeping the physical plant in order. By bearing in mind that smooth track means a pleasant trip and well-maintained vehicles mean dependable service, those in charge of maintenance work can do much toward popularizing public transportation and holding customers.

But they can do more than that. For one thing, the maintenance men can exert a potent influence by talking to their friends on every possible occasion about the advantages of using electric railway service. They may be able to help also by suggesting ideas to the publicity department. Perhaps a human interest story could be developed, telling how the men in the track, overhead and equipment departments keep the "wheels moving" and showing the amount of money expended for materials, particularly in local markets. It is not improbable that many of the shop, track and line men also have thought out ways and means of increasing business. Individual consultation or conferences of various departments at frequent intervals no doubt would prove very productive of worth-while ideas.

Every individual in the maintenance department must be shown that he is an actual partner in the business of rendering transportation, that he has a definite responsibility to the public and that the security of his own job depends on the success of the company. He must be shown that his duties are not discharged when he has completed his specialized task, but that he has another duty in selling rides.

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Where Transportation Planning Fails

PROGRESS in solving urban transportation problems has been extremely slow compared with that which has been made in solving many other problems connected with modern city life. Providing water supply, sewage disposal, fire protection, and the like, have presented difficult problems as cities have increased in size. But the modern engineer has achieved notable success in solving them. On the other hand, the success that has been achieved in meeting the transportation needs of the inhabitants of modern cities has been distinctly limited. Generally speaking, it is more difficult today to move from place to place in any large city than it was a generation ago.

In recent years the types of transportation within urban communities have multiplied rapidly. Walking was the original means of urban transportation, and the horse-drawn vehicle is of almost equal antiquity. Street cars are about 100 years old, although the motive power has undergone numerous changes during this period. Comparative newcomers in the field of urban traffic are the private automobile, the motor bus and the motor truck. It is their advent, of course, that has created the complicated problem which we have been struggling to solve.

Numerous plans have been suggested as means to improve existing conditions. Many of these plans have been extremely ingenious. Considered only from the standpoint of the particular conditions which they were intended to remedy, they have had much to recommend them. When put into practice, however, most of them have proved disappointing. Certain defects may have been remedied only to create others equally bad. For example, it has been the experience in numerous places where sidewalks have been narrowed to provide more room for vehicular traffic, that the pedestrian traffic has overflowed the small space remaining for it, and its presence in the roadway has become a greater obstacle to the expeditious movement of vehicles than was the previous sidewalk.

Lack of recognition of the inter-relationship of all kinds of urban transportation facilities is the primary cause of the failure of many well-meant plans. Independent planning of individual facilities is bound to be unsatisfactory. This is clearly brought out in an article on "Co-ordinated Planning" by Frederic A. Delano, appearing elsewhere in this issue. In the past it has been customary to consider one problem at a time. By that method we have got nowhere. Only when the transportation problem is considered as a whole will real progress be made.

An Ounce of Willingness

DESCRIBING the qualifications of a lawyer he wished to employ, a certain prominent American business man is reported to have said: "I don't want somebody to tell me what I cannot do. I want somebody to tell me how I can attain the objective I have in mind." In that statement lies an important suggestion for the transportation man. He is the recipient of numerous requests to do this, that or the other thing in regard to the service under his direction. Many of these requests are impractical. But if he simply tells the proponents of the idea that he cannot do what they want, he will almost certainly fail to satisfy them even though he explains his reasons fully. On the other hand, he cannot allow himself to be led into unsound practices simply to please the public. What he can do, however, is to confer with them with an open mind to see if some way cannot be found to accomplish in a modified form the essential purpose of the suggestion. Under such circumstances an ounce of willingness is worth a pound of explanations.

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Responsibility for Service to Airports

TRANSPORTATION service to and from flying fields is far from being adequate and satisfactory, according to recent comment in *Aviation*. That paper points out that many flying fields established in the open country enjoy no organized transportation service at all. It sees an opportunity for bus lines using small units operated on more or less flexible schedules.

Passenger traffic to and from airports is extremely variable. Regular scheduled bus or car service on a route passing close to the flying field might be adequate to take care of casual traffic, but it requires no great stretch of the imagination to understand that regular schedules would hardly meet the needs arising from the arrival and departure of large transport planes at uncertain hours.

A recent case before the California Commission, reviewed elsewhere in this issue, goes to substantiate this idea. There the commission frankly said that airplane passengers demand a special type of transportation service to and from fields, and awarded the right to perform such service to an independent bus operator, although Motor Transit and Pacific Electric Railway both said that their regular scheduled services were adequate. The commission, however, protected the existing carriers by specifying that the operator who was successful in establishing his claim would not be permitted to give intermediate service.

Whether or not special bus service to airports would be profitable depends of course on their location, the volume of traffic and various other factors. *Aviation* suggests that the airports might subsidize the service. Perhaps that would be the best solution of the problem. Certainly the established local transportation company cannot be expected to furnish airport service at a loss.

Co-ordinated Planning of Transportation Facilities

Vital to Civic Progress

By
FREDERIC A. DELANO
Chairman Regional Plan of New York and Environs
Chairman National Capital Park and Planning Commission

Development of new types of service does not mean that we can get along without the older types. Each has a place, and a definite relationship to the others. Independent planning of individual facilities is unsatisfactory. The transportation problem must be considered as a whole

TRAFFIC and transit problems have become an integral part of city and regional planning. The whole problem of housing and zoning, the growth of the city and its future development, are necessarily wrapped up in it. No city can grow without adequate transportation facilities. The increasing concentration of population in our urban centers has complicated the problem. It has been further complicated in recent years by the multiplication of the kinds of transportation service available. Whereas horse-drawn vehicles once adequately met all the transportation needs of our urban population, today the horse has almost disappeared and we have a medley of electric surface cars, rapid transit lines, automobiles, motor buses, taxicabs and motor trucks. To make adequate provision for any one of these types of transportation is a real problem. To provide for them all, each in its proper relation to the others, is a vastly more intricate problem. But this is the task which we must undertake if we are to have orderly civic development. Independent planning for different kinds of transportation is not enough. We must have co-ordinated planning.

Many of the difficulties in dealing with current problems are due to the prevailing unwillingness to look beyond them to what lies ahead. The idea is fallacious that the problems of today can be solved without study of trends of growth, and planning for the future. The policy that should be pursued in the interest of posterity is the one that will be of most help to the present generation.

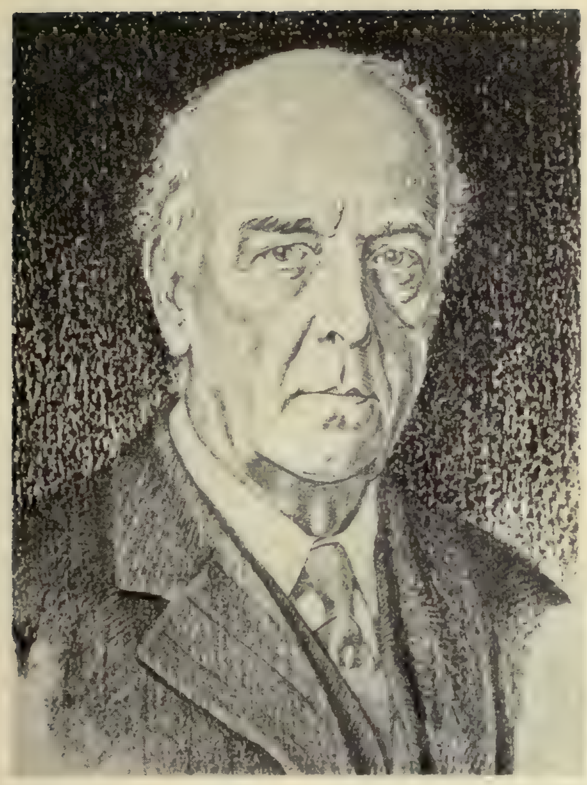
Generally speaking, city planning may be inspired by one of three policies. The two that are easiest to follow are: first, that practical policy which does not extend beyond the concrete and the present, and second, that idealistic policy which is based solely on the abstract and the future. Under the former policy, proposals are made to flow with the current created by established habits and vested interests; and under the second they are confined to what ought to be, without regard to the limits imposed by unalterable conditions. The one policy lacks soul, and the other flesh and blood, and those who follow them find planning a simple exercise.

The third policy seeks an ideal based on realities—an ideal shaped by the processes of reason and not by the play of fancy. This involves greater labor but seems to present the only possibility for improving conditions of life and society.

Such observations as these apply particularly to the problem of providing adequate transportation facilities. In planning for the future we must have regard to circumstances as they now are, but we must also be alert to seize the openings toward better things that appear on the horizon of the future. An ideal, to be a worthy one, must be capable of being expressed in action; and it must be action based on a study of future trends and possibilities as well as past events.

The electric railway industry was founded about 50 years ago, and has had a tremendous development. It is not so long ago, say 20 to 25 years, when this young giant was coming into full manhood and extending his field broadly. The cities had by then been covered with a network of lines. Promoters were finding it possible to extend out all over the countryside and their interurban lines were giving the steam railroads a hard rub. They chose in many instances to parallel existing steam railroads and by means of better and more convenient service, to take away a large share of the established business of the trunk lines. Yet admittedly they built up new business, too, and opened up new territory.

Today the situation is greatly changed. The advent of the automotive age has brought along with it the



Frederic A. Delano

As CHAIRMAN of the Committee of the Regional Plan of New York and its Environs, Frederic A. Delano has participated actively in the most far-reaching civic planning project of modern times. In this work the provision of adequate transportation facilities has been one of the major problems. As a member of the Parks and Planning Commission of Washington, D. C., Mr. Delano has had first hand experience with similar problems in different surroundings. To the consideration of these problems he brings a wealth of transportation experience. Beginning as an apprentice machinist in the shops of the Chicago, Burlington & Quincy Railroad, he occupied positions of steadily increasing importance until he became president of the Wabash Railroad. He also served for six months as a member of the Federal Reserve Board and was a Colonel in the Transportation Corps of the Army in France. With this broad background of experience, he brings out many pertinent facts concerning the place of transportation in city planning.

enormous good roads development, for which the expenditures in 25 years have exceeded the entire investment in steam and electric railroads since their inception. Paving projects have transferred city streets from mudholes into boulevards, so that today unpaved streets are a rarity. These changes have, in a measure, turned the tables on the successful venture of a quarter-century back in the electric railways.

But progress always is ruthless. Success for the moment does not carry with it any guarantee that it will continue over an extended period. All business is hazardous. This is a fact that is not always comprehended by those who make our laws. In the clipper ship era a merchant might make 100 per cent profit on a single voyage—or he might lose his ship and its entire cargo. Today we have made progress in diminishing such hazards, but no safeguards can afford protection against changing conditions. The clipper is now a thing of the past, although ships still sail the seas.

Notwithstanding this, I do not believe for a minute that the day of the electric road, urban or interurban, is over. Undoubtedly there is a definite place for it, as well as for free-wheel transportation, such as the automobile, the taxicab and the motor bus. The electric railway superseded its horse-drawn predecessor by virtue of its greater speed and comfort. But the electric car, although far in advance of the times when it was first introduced, has been allowed to lag behind as compared with the notable progress of automobile transportation. This has not been because the electric car is incapable of improvement or better adaptation to the needs of the present, but because its operators have not paid sufficiently close attention to the changing public demand.

Obviously the motor bus has offered difficult competition—that of a commodious vehicle traveling on a free highway with no obligations of construction or maintenance costs. The new vehicle, designed after the experience of years of street car progress, with its comfortable seats and comparative freedom from noise, was a pleasant contrast to the rather antiquated type of street or interurban car in widespread use. Accordingly it gained immediate recognition from the traveling public. Then, too, as the highways were straightened and widened and otherwise improved, the speed of the bus was increased while that of the street car or the interurban car remained unchanged. Today the bus frequently can and does make better speeds than the car.

Despite all these facts, it is becoming increasingly evident to thoughtful citizens that the electric railway has not outlived its usefulness, but that each instrument of transport has its proper place and its inherent limitations. The electric street car and the interurban still afford the best vehicle of mass transportation within limited distances, say 25 miles. The motor bus is the best for moderate traffic density, and as an adjunct or feeder to the rail lines, electric or steam.

But the electric lines must in their turn tear a leaf from the experience of the motor bus and seek to improve their own method of transport by making it decidedly more comfortable and less noisy, as well as speedier, and at the same time safer, than the free-wheel vehicle. To accomplish these purposes, electric railway men must give thought to a complete redesign of their vehicle and its driving mechanism, making it (a) lighter; (b) less high and clumsy; (c) less noisy; (d) capable of accelerating faster and operating at higher speeds.

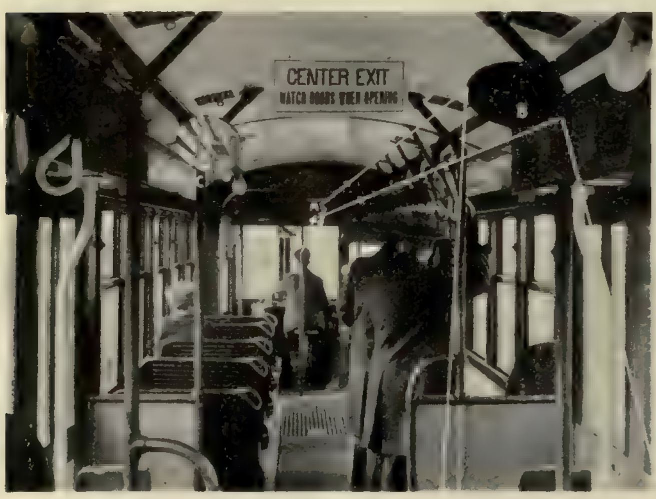
It is recognized that high-speed mass transportation cannot be maintained with safety except on private rights-of-way, or as is done in a number of cities, on a section of the main thoroughfare set aside for this purpose. Examples of this latter method may be seen in the center parkways in Boston, Washington, New Orleans, and a number of other cities. Such segregation of traffic is justified only when it truly serves the public interest, and gives the greatest good to the greatest number. As it can be readily shown that one street car carries the number of passengers represented by two buses, or 25 private cars and taxicabs, the justification should be easy enough where, but only where, the density of traffic served warrants the existence of surface street car lines.

Furthermore, the safety of citizens requires that more attention be given to allocating the streets to certain definite uses, for it is not desirable or necessary that every street should be a main thoroughfare. From this it follows that the main thoroughfares should be so laid out that they can carry a maximum volume of business, and they must be protected so that they can carry this maximum volume with safety. This may mean the reduction of crossing traffic wherever possible, the avoidance of left-hand turns, the denial of the right of "parking" on these main thoroughfares. By thus limiting the uses of the street, it should be possible through the adoption of regulations or with the assistance of signals, to contribute to the safe and yet speedy passage of vehicles on these main thoroughfares. Where it seems desirable to reserve these highways for free-wheel vehicles, the electric railway lines can be placed in a parkway, provided the cross traffic is not too great. Where it is, they can be placed underground, or in an open cut with stations sufficiently close to make travel convenient.

If the managements of electric railways will pay heed to the changing demands of the public and adopt the necessary improvements to modernize their service they can continue to hold an important place in the community transportation system. It will never again be an exclusive place such as it was years ago. The other facilities which have been developed are immensely valuable in their own way. The heart of the problem in planning for the future is to correlate the services of all facilities so that each is of maximum usefulness.

Double Mirror Arrangement Promotes Safety on One-Man Cars

By J. H. Middlekamp
Assistant Engineer
Brooklyn & Queens Transit Corporation



This arrangement of mirrors gives the operator an unobstructed view of the center exit. The center mirror, marked *C*, is used for operation in the opposite direction, and shows the image, which is transmitted to the front mirror.

BECAUSE safety is a factor of extreme importance in transportation service, many special devices have been introduced on one-man cars for the protection of the passenger resulting in making these cars safer than most two-men cars. The Brooklyn & Queens Transit Corporation is now installing a combination of mirrors on its one-man cars to provide the operator with a clear, unobstructed view of the center exit doorway and the street area for a distance of about 4 ft. outside. The arrangement is very simple, but it required a long period of experiment and study before the optical problems were solved.

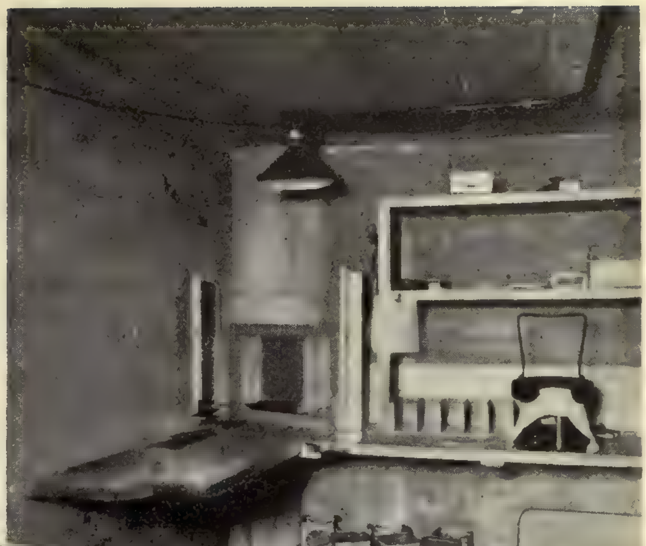
As shown in an accompanying illustration, the arrangement consists of a large mirror over the center exit and a smaller one above and in front of the operator. Since the cars are designed for double-end operation two sets of mirrors are installed in each car.

The mirror adjacent to the center door, marked *B*, is limited in size by the available headroom and other clearances. It was found that a mirror of 12-in. diameter was the largest practicable at this location. To reduce the reflection of the area in the vicinity of the door to an image of this size a high-grade, spherically convex mirror was required. This type produces distortion which is symmetrical and therefore not confusing to the eye.

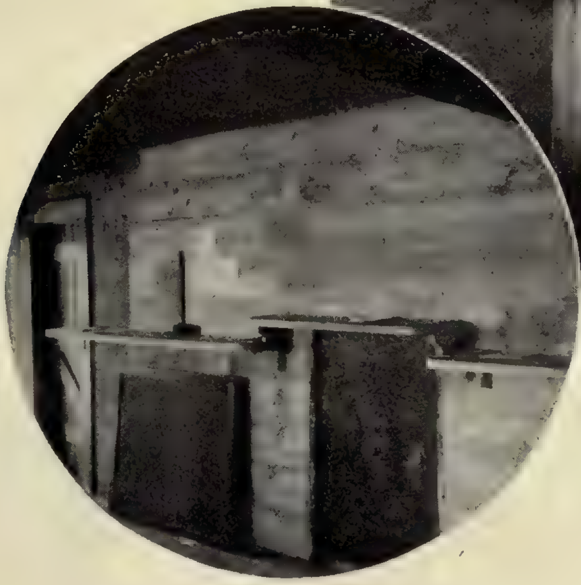
At the front of the car a 6-in. plane mirror, marked *A*, was located to reflect the image transmitted from the doorway mirror to the operator. The path of vision between these mirrors is designed to pass over the heads of all passengers regardless of how many are standing between the operator and the exit. The center mirrors are attached rigidly to the car roof, while the front mirrors may be adjusted for each individual operator.

Two 36-watt lamps were removed from the inside of the car adjacent to each door and installed in the bottom of the door engine box directly over each exit. They provide sufficient light for the mirrors to be effective at night. As a safety precaution, it is intended to install this combination of mirrors also on cars equipped with automatic mechanism controlling the center exit doors.

Receiving Clerk's Office Made Theftproof



Operators of Oklahoma Railway deliver their receipts to the clerk through a narrow slanting steel slit



The mirror permits personal contact with the operator and the screen prevents the receiver from putting his head in line with the opening

COMPLETE protection against hold-up or robbery is placed around the receiving clerk of the Oklahoma Railway as a result of the construction of a new vault in which his office is located. The vault is walled by a combination of concrete and steel 8 in. thick, and is equipped with manual as well as automatic alarms which sound in the police headquarters that are located less than a mile away.

The window into which the street car and bus operators turn their money is a narrow steel slit extending into the vault at an angle so that a gun cannot be pointed at the receiver. This slanting window looks into a mirror in which the receiving clerk and the visitor may see each other. A screen thrown across the corner of the vault prevents the receiving clerk from putting his head directly in front of the opening. Protection against attempt at entry by blasting a hole through the walls of the vault and then cracking the safe inside is also provided. Tampering with the walls will set off the alarms.

Entrance into the vault is made through a double steel door consisting of two sheets of $\frac{3}{4}$-in. steel plate. One door opens inside and the other outside. Both have heavy Yale locks. After these doors are closed at night and the clerk is placed inside, it is impossible to open them without sounding an alarm automatically to the dispatcher's office of the railway company and to the city police station.

The receiving clerk enters the vault at 6 o'clock at night, taking with him two other company employees, who, with him, search the vault and certify that no one is inside except the clerk. He then remains until the following morning when the operators of an armored truck take his receipts for the night to a city bank.

Telephones are installed in the vault, also comfortable beds and a convenient wash room. Two electric fans, guarded by heavy steel slats, provide constant ventilation. One large window to the vault is made of heavy steel slats, the outer tier slanting upward and the inner tier slanting downward, through which air may enter almost unobstructed, but which prevent entry of almost anything else.

Modern Improvements in CAR TRUCK DESIGN

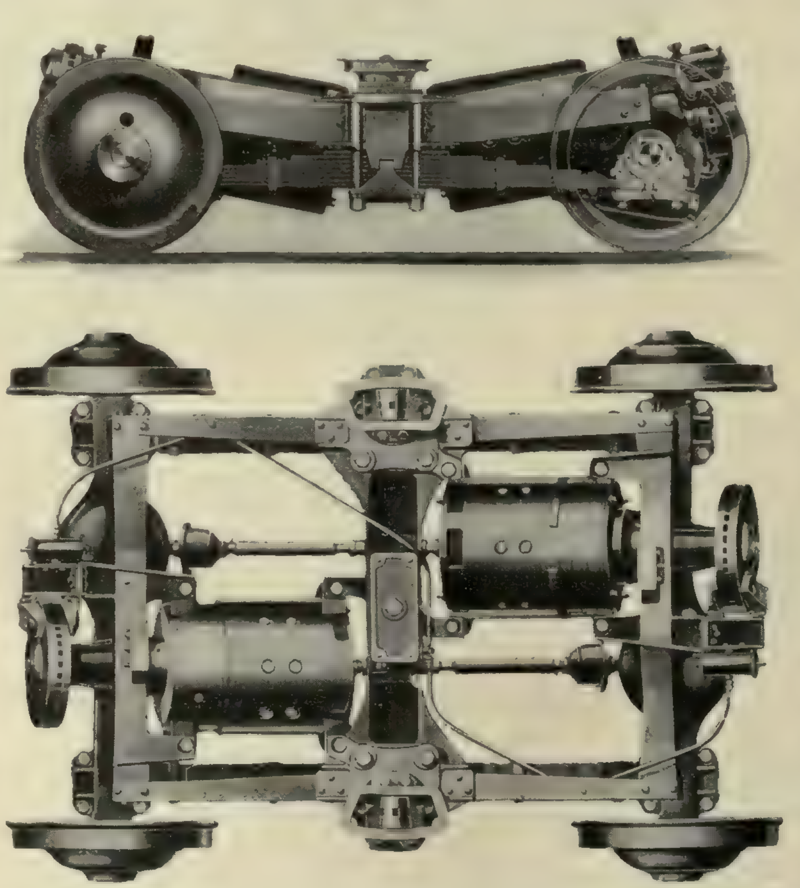
Various high-speed drives making use of flexibly suspended motors have reduced weight, especially the unsprung portion. New types of braking mechanism are being tried

RECENT departures from the conservative standard car truck for city service are numerous and permit greater riding comfort, more economical operation and increased speed as compared with what was possible in the cars of only a few years ago. While there have been a few spectacular experiments, much of this development has not attracted wide attention, although it has been a great factor in improving the performance of the cars being built today. Most of the experimentation has been in connection with designs for double-truck city cars, but single trucks have likewise undergone a searching investigation. In this article, a review is given of the most outstanding double-truck developments.

Principal aims of truck designers have been to get a reduction of weight, particularly the unsprung portion carried directly by the wheels, without sacrificing motor power but with an improvement of riding qualities. In practically every instance, two means have been adopted to attain this result:

1. Substitution of a flexible motor suspension for the nose suspension commonly used.
2. Great increase in the armature speed of the driving motors.

Along with these major changes has come a material reduction in the weight of the car body for a given carrying capacity. This change has made possible the use of a lighter truck with motors of smaller rating for the same speed and acceleration, and to a considerable extent has simplified the problem of truck design. It also has permitted a reduction in wheel diameter and over-all height of the truck. Use of high-grade steels and special materials, which have had such a marked effect in reducing the weight of the car body, has likewise made it possible to retain the needed strength in the members of the truck with a material reduction in weight.



Timken's Latest Worm-Drive Truck, the 52-B, Has Continuous Axles

The worm-drive unit is underslung, with its shaft supported on roller and ball bearings. Self-ventilated disk brakes carried on extensions of the armature shafts are actuated by air.

Motor suspensions and methods of drive must of necessity be considered together. In general, the latest practice is to mount the motors in some form of yoke or cradle carried by the truck frame and free from the axle, the connection to the latter being made through a flexible coupling. A gear case is employed which can rotate around the axle through a short arc without throwing the motor pinion out of alignment.

Spring suspensions have been simplified and improved so that the car body is carried with greater flexibility and with transmission to it of less of the road shocks from uneven track. Most of the current truck designs retain the pedestal mounting of the journal bearings, with helical springs for support of the truck side frames. These, in turn, carry the bolster through springs, which are either of the semi-elliptic type, as in

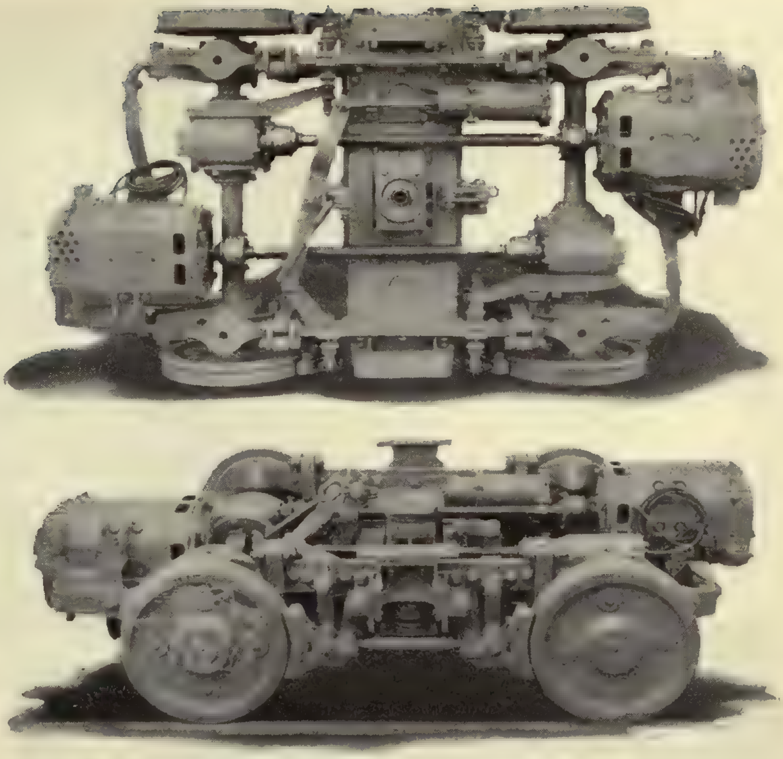
Give Superior Performance

By

MORRIS BUCK

Engineering Editor

Electric Railway Journal



Worn Drive Is the Feature of the Brill 85-E Truck

Motors are mounted on brackets extending out from the side frames, with long drive shafts crossing to the opposite axles. Wheel brakes are actuated by air cylinders mounted on the truck.

the Cincinnati truck, or a combination of semi-elliptic and helical, as in the recent Brill designs. The Timken truck, however, carries the axles at the extremities of two semi-elliptic springs, one on either side, the bolster being attached to the centers of these springs. Minor vibrations are smoothed out by the use of rubber shackle mountings for the leaf springs where they are attached to the axles.

Gear Ratios and Armature Speeds

Conventional spur gearing is limited to a rather narrow range of speed ratios. With the large power that has to be transmitted and the strength of teeth required, most of the street car speed reductions making use of a single pair of spur gears have ranged between the limits of 2 to 1 and 4 to 1. Employing them in connection with the standard 33-in. wheels that were in use for many years, the armature speeds were of necessity low and the motor weights per unit of output correspondingly high. In order to remove this speed limitation a number of changes have been made in the more recent types of drive. First of all, the adoption of smaller wheel diameters, used at the outset to reduce step heights, has permitted a corresponding increase in armature speeds. For a number of years wheels of 26 to 28 in. diameter have been used with ordinary spur gear drive. The latest trucks usually have 26-in. wheels, although some of the trucks with W-N drive have wheels with a diameter as small as 22 in.

This reduction in size of wheels has not been sufficient to satisfy all the demands of the modern designer, so in addition other more radical methods have been resorted to. These involve a change in the method of drive so as to permit of a still larger speed reduction. In some instances recent trucks have had reductions of speed through the gearing as great as 10 to 1.

Practically all the motors used with the newer drives are of the self-ventilated high-speed type developed by the electrical manufacturers for use with automotive units, either gas-electric buses or trolley buses. Armature speeds have been increased until now it is not uncommon to find motors with 1,800 r.p.m. at the one-hour rating, as compared to speeds of 600 to 800 r.p.m. in motors of the old standard type for use with single-reduction gears on 33-in. wheels. Some of these new motors are built with cast-steel frames, while others are distinguished by the use of rolled-steel frames. Due to the effective ventilation and the efficiency the output per unit of weight is high. What is of even greater importance, the continuous motor rating has been increased in a larger proportion than the one-hour rating, so that a given motor is able to handle a heavier duty cycle in relation to its size. It has been possible to reduce the weight almost in proportion to the increase in armature speed. Not only is the total motor weight to be carried much less, but the problem of designing a flexible suspension for the motor is considerably simplified. This gain in the motor is, of course, available for any type of drive which permits of the necessary armature speed.

New Methods of Drive

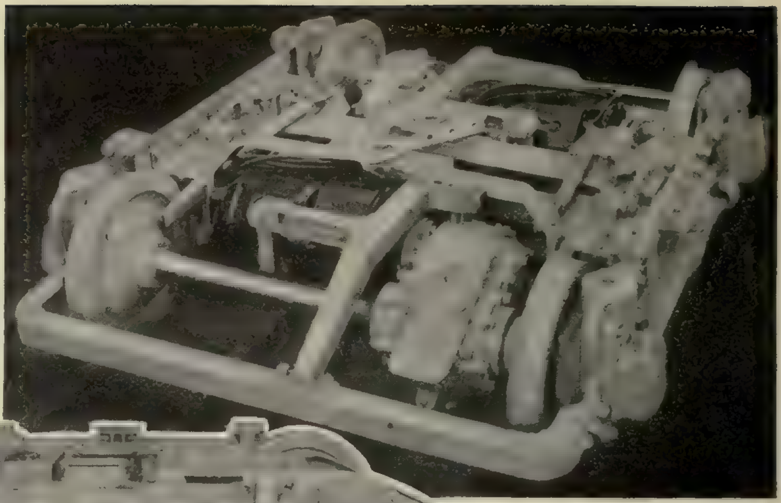
Three methods of drive have been developed and used with success on recent trucks. These make use respectively of the worm gear, the double-reduction spur gear and the single-reduction spur gear. Bevel gears have not been tried to any extent in this country, although they have been used with success on a large number of cars in Paris for several years, and they have also been adopted in other European cities.

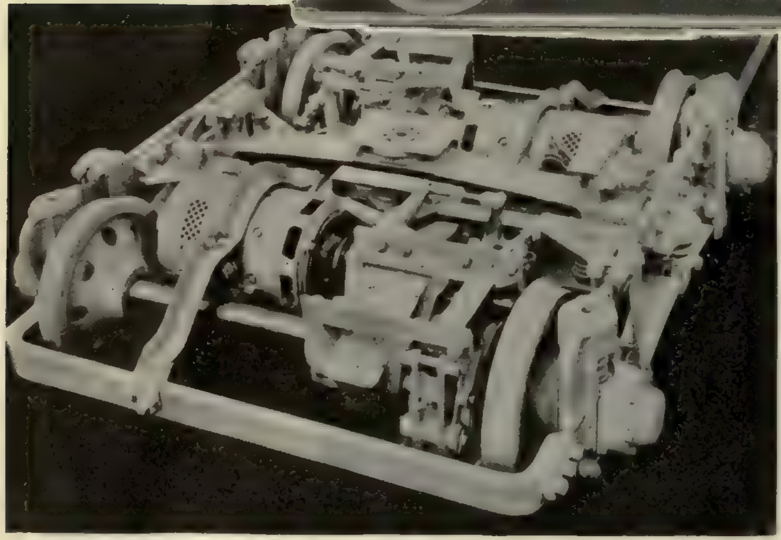
Several designs of car drives have contemplated the use of gear sets in which more than one axle is driven from a single motor, but so far as is known none of these is in practical use in this country. Complications that arise when two axles oscillating with different moments and at different times are coupled to a single driving shaft have proved great and the plan has not been found satisfactory.

Single and double-reduction spur gears necessitate a mounting of the motors with their shafts parallel to the axles, while worm or bevel drive calls for a motor mounting with the shaft perpendicular to the axles. Since the space available for motor mounting is approximately cubical, there is comparatively little difference in the size of motor that can be adapted for use with one or the other method. Worm drive, however, does permit mounting the motor at a greater distance from the driven axle, since the shaft may cross the center line of the truck, or may even pass over the opposite axle if necessary.

Developments with Worm Drive

Worm drive was introduced in this country about five years ago in an experimental unit designed by W. L. Harwood, of the Springfield Street Railway, and in another by J. R. Blackhall, of the Chicago & Joliet Electric Railway. The design has been carried on and developed by the Timken-Detroit Axle Company, which has brought out a number of changes from the original truck. All the worm-drive units that have been constructed by this company make use of an axle assembly somewhat similar to that of an automobile. Both solid and differential axles have been used. The chief reason for the use of a differential was ease in negotiating curves. However, the wear on the tires due to slippage is not nearly so important with steel wheels as with rubber, and the recent Timken trucks all have been built with solid axles.





Two Different Motor Suspensions Are Shown for the Brill 177-E1 Truck

Both of these types use the W-N double-reduction drive, the principal difference being in the use of plain bearings and wheel brakes in one and of roller bearings and drum brakes in the other.

A worm-drive truck of quite different design is the Brill 85-E. In it the motors are carried on the truck frame so that they are entirely outside the axles, the drive shaft extending across one axle to the opposite one. This arrangement removes the space limitations for the motor and results in a long drive shaft in which the vibrations of the wheels produce relatively little angularity, making the drive quite flexible. The worm is carried on top of the axle instead of below, as in the Timken design, and is covered with a small case anchored to the truck frame by means of a yoke which holds it in approximate alignment and removes strain from the drive shaft.

Advantages of Double-Reduction Gearing

Double-reduction spur gearing was tried in the early days of the electric railway, but soon was given up entirely in favor of single-reduction gearing. At that time electrical design had not advanced sufficiently to make practicable a high-speed motor, and the spur gears themselves were crudely cut and inefficient. Since then there have been many radical improvements such as better electrical and magnetic design, new forms of gear teeth, use of helical gearing, and improved methods of manufacture that make for greater precision and increased life of parts.

Employment once more of the double-reduction gears was visualized by engineers of the Westinghouse Electric & Manufacturing Company to be a means of increasing the motor speed and at the same time of permitting a flexible motor support. As a result, the W-N drive was brought out by that company as a complete unit for installation in place of the single-reduction gear on any modern truck. The unit consists of a gear mounted on the car axle and driven by a pinion on a short shaft held in alignment by the gear case. The short shaft also carries a gear which meshes with a second pinion on another short shaft to give the double reduction. The latter shaft is arranged to carry a coupling of flexible type to which the motor shaft is attached. The entire gear unit is held to the car axle so that it can rotate to a slight extent, thus giving flexibility. The motor can be carried on the truck frame, being supported entirely by the springs.

NEW TYPES OF SINGLE REDUCTION GEAR

One of the successful single-reduction gear drives making use of high-speed motors is that developed by the Tool Steel Gear & Pinion Company, and being tried out by the Philadelphia Rapid Transit Company. This has a reduction of 7.2 to 1, permitting a motor speed of double that ordinarily possible with single-reduction gearing, and approximating the speed reached in the worm and double-reduction types of drive. The motors are carried in yokes held to the truck frame and drive through a flexible coupling to a short shaft carrying the pinion, and which is held in alignment by means of the gear case.

An altogether different design of single-reduction drive has been developed by the Lehigh Valley Transit Company in an experimental equipment. This makes use of an individual motor on each wheel by carrying both gear and car wheel on a sleeve rotating on a stationary axle. The two sleeves on the one axle are kept spaced by a collar. Since each motor has to transmit only half the ordinary amount of power, as it drives one wheel only, the gearing design was simplified considerably.

RADICAL CHANGES IN BRAKE RIGGING

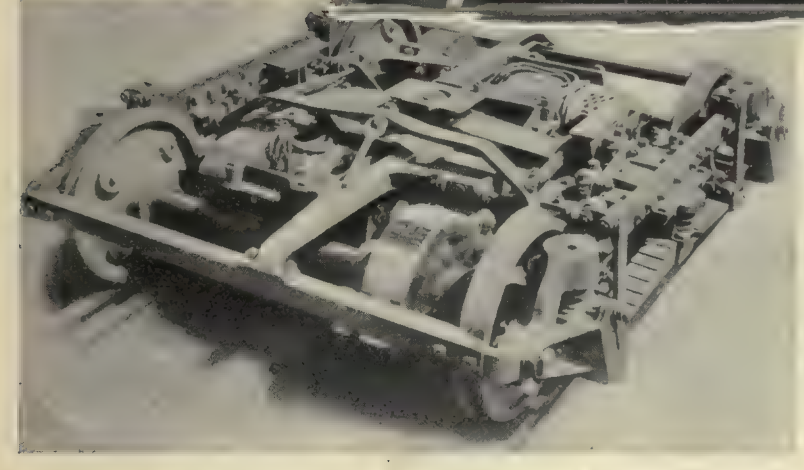
Brakes have undergone several radical changes in the new types of trucks. At first there was a trend toward abandonment of the iron or composition brake shoes pressing on the tread and flange of the car wheel, although in some of the latest designs it is being used again. The arguments against the use of the wheel brake are that it is open to dirt and water, making the braking effort variable. It also causes rapid wear of the wheel treads and may change their contour considerably. Acting at a slow speed, greater surfaces and pressures are required than with an armature shaft brake. On the other hand, the wheel brake eliminates separate drums or disks and permits some simplification of the brake rigging. Dissipation of the heat from the car wheels is less of a problem than from small drums or disks, usually largely covered by other mechanism.

In place of the wheel brake, numerous types of band and disk brakes have been tried. The first band brakes were similar to those in use on automobiles five or more years ago, consisting of bands of sheet steel lined with fabric strips, and pressing on the outside of a cast-iron drum attached to the car axle. While these brakes were found efficient the amount of space taken was considered greater than could conveniently be devoted to the purpose, and they were subject to fluctuations in effectiveness due to dirt and wheel wash. Later types have used the internal expanding construction, which also was developed in automobile practice. In this brake two or more molded shoes are pressed outward against the inside of a drum by means of a cam rigging. This type of brake uses about the same axial space, but it has the advantage that it can be placed adjacent to, or even inside, the wheel. Disk brakes, where pressure from shoes is exerted on one or both sides of a disk attached to the axle or the motor shaft, have also been used in some recent designs.

Air has been retained as the force for actuating the brake system in most of the recent truck types. With the small amount of shoe travel required, due to better machining standards and a reduction of clearances, the volume of air needed to effect a full application of the brakes has been so greatly reduced that large-capacity compressors of the ordinary type have been found unnecessary. Also certain of the air brakes have been actuated through a closed system by means of diaphragms instead of cylinders. This has reduced further the volume of air to be handled, and has made unnecessary a large supply of fresh air. Small compressors have been the rule with these recent brakes.

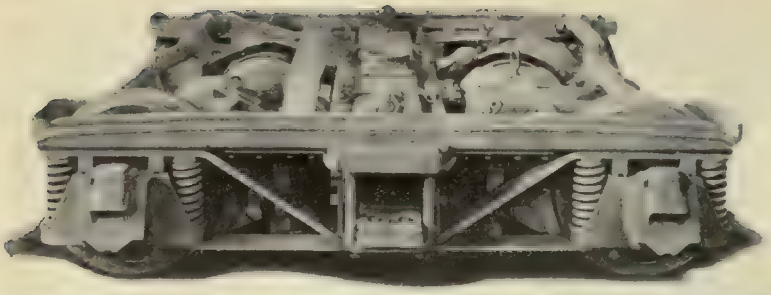
In a few instances hydraulic brakes have been employed. These also follow automobile practice, the system being filled with a liquid which flows freely but does not change its viscosity to any considerable extent with temperature. The volume of liquid to be handled is small, and little difficulty has been experienced. They have not been used to any extent as service brakes, but mainly for final stopping.

Dynamic and electro-magnetic brakes, both of which are actuated by electric cur-



The 84-E Truck Is Adapted for High-Speed Single-Reduction Gearing

This truck is similar to the 177-E1 and the same type of motor suspension. The gear unit, made by the Tool Steel Gear & Pinion Company, is connected to the motor through a flexible coupling. Both air and magnetic brakes are used.



This Cincinnati Truck Incorporates W-N Drive with a Novel Motor Mounting

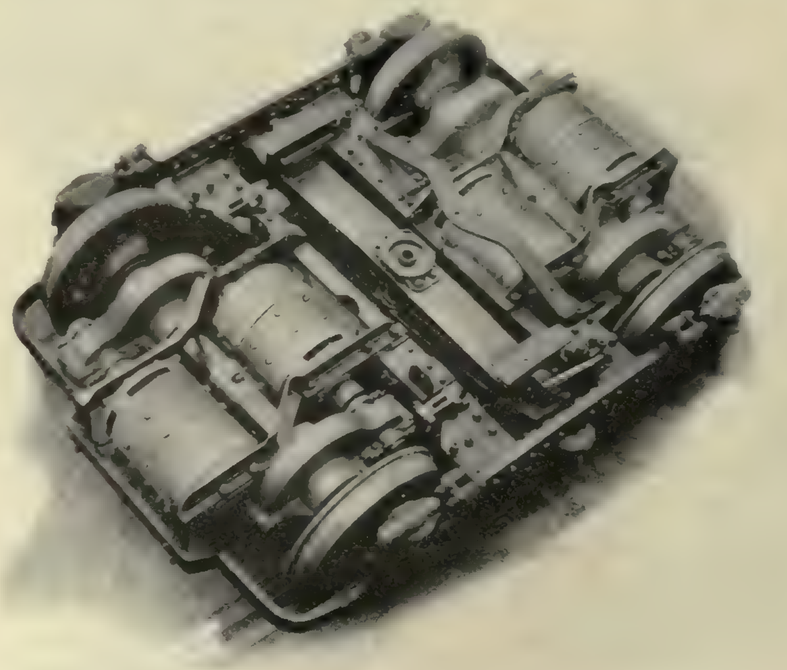
Arch bar construction with pressed-steel reinforced side frames, wheel brakes and wing pedestals with flexible spring support are features.

rent, have found considerable adoption. In the dynamic type the motors are short-circuited through a resistance. Usually the fields are connected to the line so that the armatures rotate in a strong magnetic flux, the resistance in the armature circuit reducing the current flowing. By this means very powerful braking effort can be obtained. No special equipment on the track is needed. Electro-magnetic brakes have been attached to the trucks so as to pull against the rails, the shoes either touching the rails directly and giving a frictional drag, or merely increasing the attraction between the car and the rail, allowing greater pressure on the wheel or drum brakes.

Air or electric brakes have in general been used for service applications, and any of the several types have been used as auxiliary emergency of holding brakes. In a number of designs the magnetic brakes have been arranged so that they are set automatically as an emergency feature. Hand or hydraulic brakes have been used for holding the car after it has come to rest when its speed has been reduced to a low value.

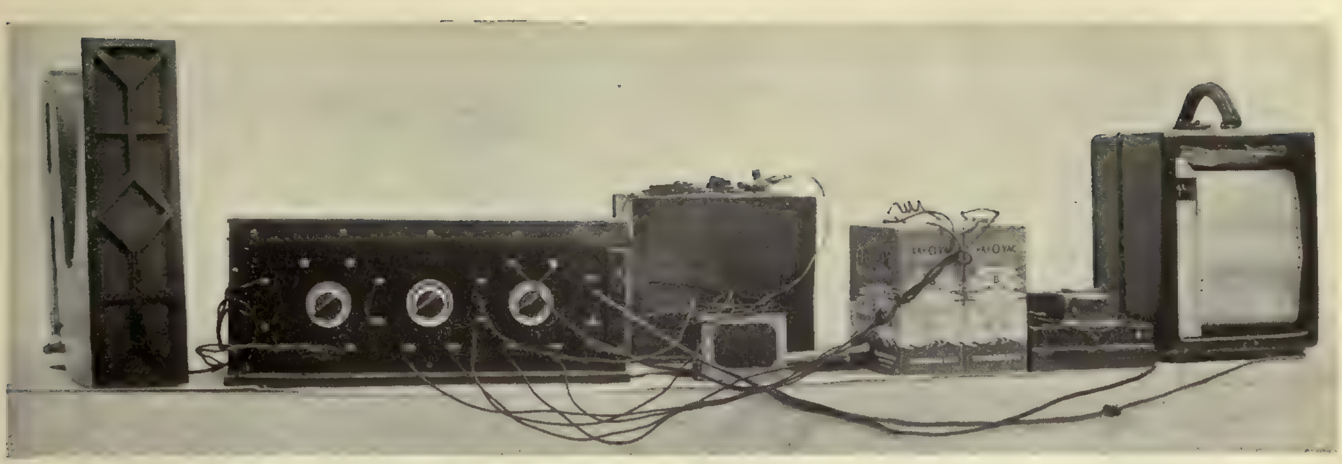
All of the changes in design have had the net result of reducing greatly the truck weight. Small wheels in themselves are much lighter than standard 33-in. wheels. Motor weights, as explained previously, have been reduced about in proportion to the increase in armature speed. The car bodies of today weigh little more than half as much as bodies of the same size built ten years ago. Altogether, the weight carried per wheel is only slightly over half what it was with the former standard cars. Naturally the truck members have been reduced in size and in weight.

On the other hand, the introduction of special drives has added somewhat to the weight of the truck. The double-reduction gear sets or the worm-drive axles have more parts than the single-reduction type and require considerable stiffness in order to prevent undue wear on the drive units. The superior riding qualities obtained by taking the weight of the motors off the axles and suspending them from the truck frame, so that their weight is carried through the medium of the spring system, are so great that the relatively small additional weight involved seems fully justified. If the same results can be obtained with the new types of single-reduction drive they should be on a par with the others in this respect. In general, all of the changes inevitably point to superior riding qualities, quietness, and reduced cost of maintenance.

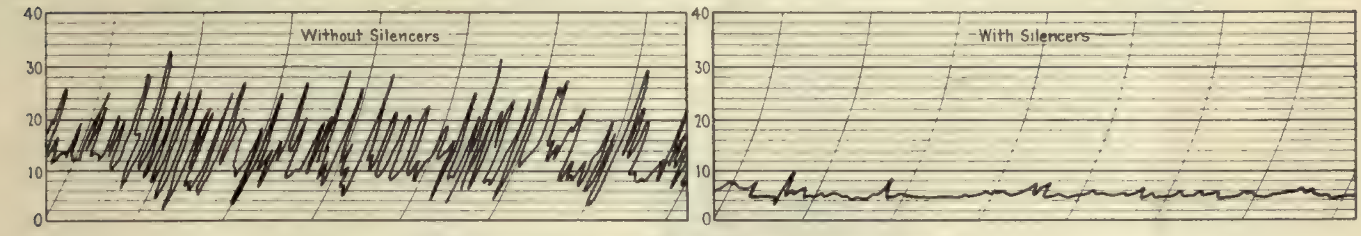


The Allentown Split Axle Drive Is Mounted on a Modified Brill Truck

Two motors for driving individually the wheels on each split axle are mounted in a common cradle supported by the truck frame. The connection to the driving pinion of the single-reduction gearing is made through flexible couplings.



Apparatus developed by Boston Elevated Railway for recording comparative amplitude of various noises encountered in operation



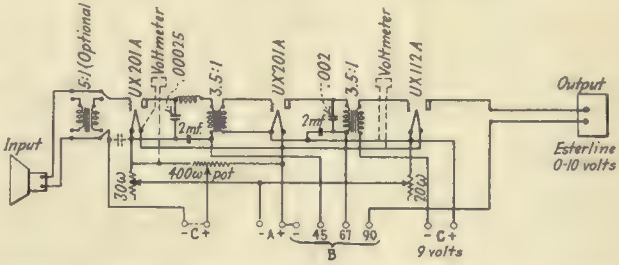
Noise test of six turnstiles with and without silencers

Noise Recorder Developed at Boston

By J. WALTER ALLEN
Electrical Engineer Boston Elevated Railway

INDUSTRY has for some time been cognizant of the deleterious effect of noise and has made numerous improvements, such as the use of sound-absorbing materials in buildings, cars, buses, etc., and by the use of rubber and other resilient materials. Noise, in the commonly accepted definition, is an aggregate of sounds composed of many fundamental frequencies and harmonics of various degrees of energy content. Accoustical engineers have found that the human ear is not affected to the same degree by sounds of equal amplitude but of different frequencies, and that its response to sounds of varying amplitudes follows approximately a logarithmic curve. During the past few years considerable effort has been expended in analyzing the various types of noise and in expressing this analysis in a visual manner.

About four years ago, the Boston Elevated Railway was experimenting with certain modifications of surface car equipments in the hope of reducing operating noises. For the purpose of comparing the noise made by the experimental car and that made by a similar car with standard equipment, use was made of a special radio interference equipment, which was designed to obtain a graphic record. As there was insufficient amplification, however, readings were taken with a Weston voltmeter in the output circuit. The averaged figures gave a fair indication of the results sought, but it was felt that graphical data would be very desirable. This led to further experiments, as a result of which a new noise recording apparatus has been designed. The noise recorder consists of a three-stage audio amplifier into which is fed electrical impulses generated in a magnetic type of microphone, which impulses are amplified, rectified and finally recorded on an automatic Esterline recording voltmeter, as shown in accompanying illustrations.



Wiring diagram of noise recording apparatus used at Boston

Reference to the wiring diagram shows that a means is provided to bias the first tube and for fine adjustment the use of a 400-ohm potentiometer is available. During the experiments, however, it was found that if a voltage of 4.5 volts was maintained across the filaments of the tubes and plate voltages of the values as indicated, no external "C" bias was required for the first tube, the potentiometer being sufficient for good results. The second tube works only on the normal bias of the "A" battery. By the use of a 9-volt "C" battery bias of the last tube, the pen of the recorder floats practically on the zero line with no input.

This apparatus has been used to compare the noises of different types of cars passing certain points; in analyzing the clicking at trolley ears of different design; the study of the benefits of shockproof trolley poles; to compare the noise of pneumatic tools with and without mufflers, and in an analysis of the advantages gained through the use of silencers on a battery of turnstiles. Accompanying charts show the results of two tests of six turnstiles, the first being made with the machines as normally operated, and the second, after they had been equipped with silencers.

No attempt has been made to calibrate the curve to be read in decibels or other scale of noise units, as all tests required to date have been of a comparative nature only. This device, although crude as compared with later laboratory testing equipments, was built at small expense and the results with it have been entirely satisfactory.

Trolley Wire Life Prolonged by Regular Ear Renewal

Public Service line crew renewing trolley ears. Periodic renewal has prolonged life of trolley wire approximately 50 per cent

RENEWAL of trolley ears at stated intervals, regardless of wear, has prolonged the life of trolley wire approximately 50 per cent on the Essex Division lines of Public Service Co-ordinated Transport, Newark, N. J. Under the present plan, the frequency of renewal depends upon the amount of service operated over a particular line. Each section of line, however, has a definite interval for ear renewal and when the work is begun on one section it is continued without interruption until that section has been completely re-equipped with new ears.

Another factor which the management believes has been influential in reducing the number of trolley wire breaks has been a change from the 16 in. ears, formerly used, to 9 in. ears.

Standardization of the height of trolley wires above the pavement has also tended to prolong the life of the trolley wire. The present standard height is 18 ft. Arcing of trolley wheels due to high wire and slow acting trolley catchers has been practically eliminated as a result of this standardization.

Another important factor in improving overhead line maintenance has been the substitution of hard gray fiber material in place of wood in section insulators, switches and crossings. Experience of this company indicates that the fiber lasts about three times as long as wood.

An indication of the results being accomplished by the changes in methods and materials used for overhead line maintenance is found in the record of more than 1,000,000 miles of car operation during the month of March without a single trolley wire break.

THIRD PERIOD OF

Electric Railway Journal Maintenance Contest

BEGINS MAY 1

Recently constructed building in Chicago, used for special inspection and repair work on trolley buses

Trolley Bus Maintenance Practices *Becoming Standardized*

As operating companies gain experience fewer troubles develop and costs become lower. Railway personnel is generally employed in maintenance of trolley buses with additional specialists for certain jobs

By

CLIFFORD A. FAUST

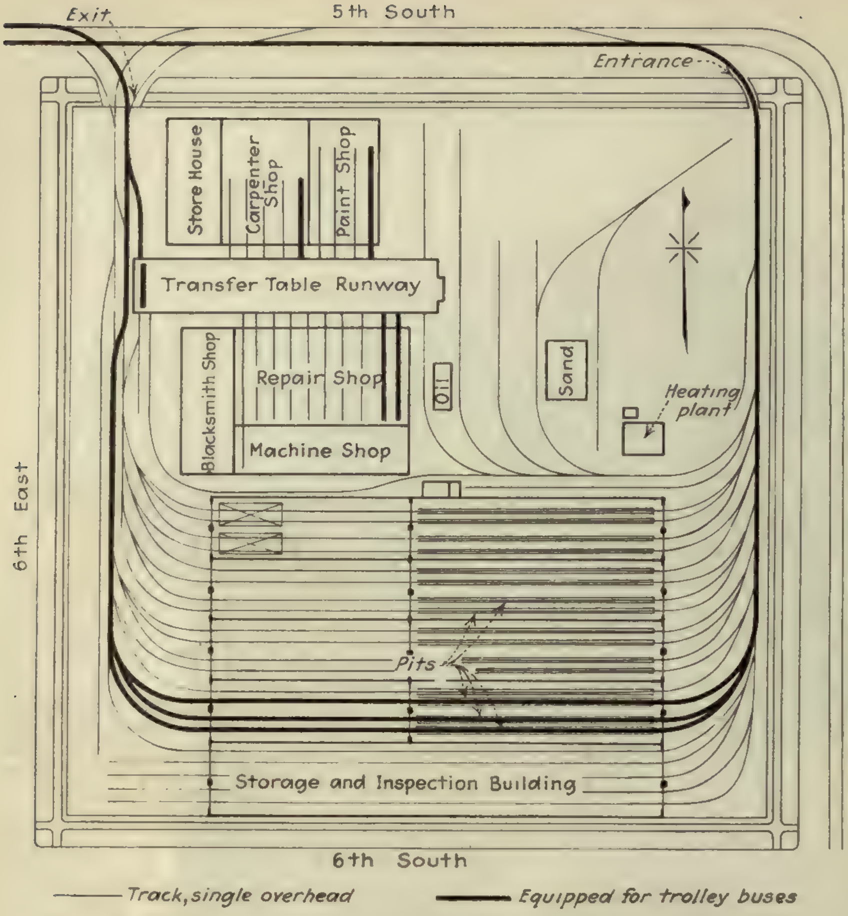
Assistant Editor

Electric Railway Journal

AFTER groping in the dark for a time for satisfactory standards and systems of trolley bus maintenance, American operators are now following practices which are fairly uniform. Regular mileage intervals for inspections, light repairs and overhaul have been set up and forces trained for the special care of the vehicles. As a result, fewer difficulties are being encountered, pull-ins are being reduced and maintenance costs are being lowered materially.

At the outset the trolley bus usually was treated either as a "stepchild," being shifted about from department to department for care, or as a "special pet," receiving particular attention from several departments. In the first instance it was difficult to set up any regular procedure for maintenance or to establish reasonable costs. In the second instance, no one group became specially proficient in trolley bus maintenance and the extra attention increased the cost considerably. As the use of the vehicle has increased, however, it has assumed a regular place in the maintenance scheme.

On all properties in the United States where trolley buses are now operated they are being maintained by street car personnel, aided by a few specialists to take



Several tracks were converted for trolley bus use in the main shops of the Utah Light & Traction Company

New Orleans trolley bus in front of the Carrollton shops, where the vehicles are maintained

care of tires, steering gear and other automotive parts. Since the bodies are of the street car type, the regular railway body repair men have been found competent to keep them in good condition. Current-collection devices, controls and motors are similar to those used on street cars, so it has been found entirely practicable to have men familiar with the electric equipment of cars take care of these parts.

Carhouses, or buildings adjacent to them, are used by all the operating companies for the storage and repair of their trolley buses. Chicago recently completed a new building adjacent to the North Avenue carhouse for inspecting and repairing its buses and trolley buses. Detroit is planning to erect a new building in the near future for the exclusive use of its trolley buses. All other companies have double overhead facilities in their regular carhouses. Equipping a carhouse for trolley bus use requires only the addition of a negative wire along the path to be traversed by the vehicle and wheelguards along pits. Aside from the addition of equipment to aid in special work like lubrication or brake testing, no other changes are necessary.

ESTABLISHED PRINCIPLES GOVERN TROLLEY BUS MAINTENANCE METHODS

Since the trolley bus possesses certain characteristics of both the street car and gasoline bus, the general principles for determining a system of maintenance have been formulated by using those principles of established practice that apply to the new vehicle. Ordinary street car or gasoline bus maintenance programs are not suitable in their entirety for trolley buses. As for other vehicles, the trolley bus inspection and overhaul periods are based on mileage rather than on time. Individual mileage records for both the vehicles and the units of equipment on each vehicle are necessary for the proper maintenance of inspection, servicing and repair programs. Definite procedures for all maintenance work also should be outlined to obtain the best possible results. For daily and general inspection, lubrication, unit change and overhaul, regular routines should be established.

Daily inspection is being given on all properties operating trolley buses. This is accompanied by a careful record, consisting of inspectors' findings and running repairs. All defects discovered by the inspector are rectified before the vehicle is allowed to return to service.

On every system the general inspection is considered the most important of all the maintenance activities. It consists of a thorough inspection, adjustment and repair to every part of the vehicle. The usual plan is to make notations on a printed form containing space for each item requiring attention. The items should be arranged on sheets in the same order as they are to be inspected. This inspection is ordinarily made after 5,000 miles.

Lubrication schedules, likewise, are based on mileage. Certain parts, of course, must be lubricated more frequently, while others can be taken care of at longer intervals. The regular program includes such items as air compressors, distributors, generators, fan bearings, motor bearings, steering mechanism, drive shaft, rear axles and trolley wheels.

Unit replacement has been found advantageous for three systems in getting the most service out of vehicles and their parts. The necessary records involve a certain amount of bookkeeping, but the knowledge obtained of the performance of the various units and their upkeep cost is extremely valuable.

Complete overhaul of the vehicles is made at intervals more frequent than for street cars, but less frequent than for gasoline buses. As yet, however, there is no general agreement as to the mileage for overhaul. This is probably because most of the modern systems are still comparatively new and the matter is still undergoing study.

CHICAGO METHODS SYSTEMATIZED

Trolley buses of the Chicago Surface Lines, totaling 89, are stored and maintained at a new building and yard, adjacent to the North Avenue carhouse. The building, constructed especially for trolley bus and gasoline bus use, is designed for special inspections and minor repair work. Ordinary daily inspection is conducted outdoors in the storage yard, while heavy repairs and overhaul are made in the company's main car shops. In future additional trolley bus depots will be established in other locations for storing and maintaining part of the vehicles. Details of the practices of this company were given in an article published in the February issue of the JOURNAL.

At the end of each day's run, the trolley bus operator turns his vehicle over to a special inspector and, at the same time, reports in writing the condition of the vehicle, noting any defects which may have come to his attention. The inspector then proceeds to make his examination, following a definite routine. If no repairs are needed, the vehicle is marked "O.K." by the inspector. It is then run around a loop and placed in position, ready to go out again. If work is required the vehicle is run into the shop building, accompanied by the inspector's written report of what is wrong.

In general, repair work on the trolley buses is done by a force of mechanics and electricians who have been transferred from similar work in the car shops. The inspectors, too, are men who have had past experience in the inspection and maintenance of railway equipment. A few inspectors, however, are employed to look after steering gears, tires, axles and other automotive parts.

In addition to the daily inspection, a more comprehensive one is made after 5,000 miles. The thoroughness of this inspection is not left to the discretion of the maintenance personnel, but is carried out according to a comprehensive plan. A set of instructions has been prepared, specifying the tests to be made of the various parts. Each test is numbered and a space is provided with a corresponding number on the inspection report form to be filled in as the test or repair is made. In the main, these instructions are the same for all types of trolley buses, varying only in minor ways to conform with the specifications on the different makes of vehicles used on the system.

TROUBLES BECOMING FEWER AT SALT LAKE CITY

Trolley buses of the Utah Light & Traction Company are maintained at the company's carhouse, located at Fifth South Street and Sixth East Street, by a force recruited from the street car personnel. In the main inspection and storage section of the carhouse three lanes were made available for trolley buses by erecting negative wires and converting the pits which extend more than half the length of this building. In addition to these, two tracks in the repair shop, one in the carpenter shop and one in the paint shop, were equipped for trolley bus use. The transfer table, which serves the three last-named shops, also accommodates these vehicles. In altering the pits 12-in. planking was installed on the inside of each rail and a guard rail erected on the inner edges to guide the vehicles.

At the completion of the daily run, all vehicles are given an inspection and have the interiors cleaned. Any necessary repairs are made immediately. Every 1,000 miles the vehicles are given a general inspection, all details of the equipment being checked carefully. Lubrication of most parts also is made every 1,000 miles. Certain of the automotive parts, however, are lubricated every 300 miles, while armature bearings of the ball type are lubricated every 3,000 miles. Exteriors of the vehicles are washed every 500 miles, while the interiors are washed every 1,000 miles.

To obtain the best results, mechanics should follow a regular routine in caring for trolley buses

When trolley buses were first placed in operation in Salt Lake City, a few difficulties arose with the equipment. However, as the forces became familiar with them, these troubles were gradually reduced. Analyses of troubles during 1929 and the first half of 1930, as recorded by the pull-in records, road calls and inspectors' reports, show that most of the difficulties have arisen in the trolley assembly, electrical control and brakes. Most of the trolley troubles were caused by stiffly swiveling bases or harps, insufficient pole tension, slack overhead, improperly designed or adjusted equipment, and maneuvering too far from the wires. Improved equipment, careful alignment of harps, proper lubrication and inspection, close adjustment of trolley pole tension and correct alignment and installation of overhead, have practically eliminated these troubles.

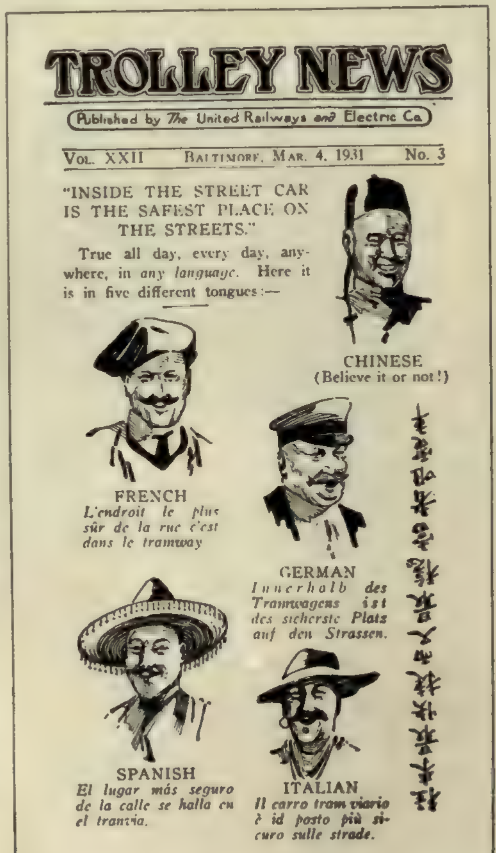
All of the 26 Salt Lake City vehicles are equipped with three sets of brakes—dynamic, air and hand. The principal source of brake trouble came from improper adjustment of the braking cycle. Dynamic braking from the higher speeds of 35 to 20 miles would give prompt action, but when braking from 12 miles or less, the dynamic braking action was sluggish and the operator, becoming alarmed, would give the brake pedal full pressure, apply air too soon and stop the coach with a jerk. Greater familiarity with the brake system is constantly reducing troubles from this source. Tire manufacturers have made trouble from this source almost neglible, according to the management, by greatly improved design, construction and maintenance. Front tire punctures are practically unknown, and rear tire flats do not interfere with operation because the vehicles have dual tires. Tire mileage is on the increase, averaging more than 26,000 miles per tire.

Maintenance Practice on Other Properties

The four trolley buses of the Rockford Electric Company, Rockford, Ill., are housed, inspected and repaired in the company's carhouse at Kishwaukee Street and First Avenue, a short distance from the regular route. One of the tracks in the carhouse, with a pit long enough to accommodate all four vehicles, was converted for trolley bus use. The vehicles, when they are pulled in, make a turn in front of the carhouse and back in over this pit, those needing the most attention being placed at the rear. Thus located, none of the vehicles has to be moved even for repairs prior to being placed in service the next morning. The pit was made suitable for the movement of trolley buses by inserting within the car rail a brace made from 3x5-in. angle iron, trussed to T-iron braces. This angle-iron inset allows trolley buses to be backed along the pit with safety and also permits street cars to be moved over this track into the paint shop at the rear.

All maintenance work in Rockford is done by street car mechanics and electricians. One man, assigned to the trolley buses, makes an inspection every night and takes care of necessary light repairs. Every 1,000 miles he makes a general inspection. A second man is assigned to the lubrication of the vehicles, made every 1,000 miles. The daily and general inspections, which are very thorough, have kept the vehicles free from trouble. So far they have operated more than 75,000 miles without a single road failure.

Telling the Story in Six Languages



TROLLEY NEWS

(Published by The United Railways and Electric Co.)

Vol. XXII Baltimore, Mar. 4, 1931 No. 3

"INSIDE THE STREET CAR IS THE SAFEST PLACE ON THE STREETS."

True all day, every day, anywhere, in *any language*. Here it is in five different tongues:—

CHINESE
(Believe it or not!)

FRENCH
L'endroit le plus sûr de la rue c'est dans le tramway

GERMAN
Innerhalb des Tramwagens ist des sicherste Platz auf den Strassen.

SPANISH
El lugar más seguro de la calle se halla en el tranvía.

ITALIAN
Il carro tram viario è id posto più sicuro sulle strade.

In a recent issue of *Trolley News* the United Railways & Electric Company of Baltimore used this interesting means of attracting attention to the fact that "Inside the street car is the safest place on the streets"

In Baltimore, the three trolley buses, operated by the United Railways & Electric Company, are housed and maintained in a carhouse, located midway between the terminals of the line. This building is no longer used for street cars, so that the trolley buses have exclusive use of it. Since only one of the three vehicles is required for regular service, only one mechanic is needed. He gives them a daily inspection and makes all light repairs. He also is responsible for their cleaning. Major repairs, overhaul and painting are taken care of in the Carroll Park shops, to which the vehicles are towed when work is necessary.

As in the other cities, the thirteen trolley buses of the New Orleans Public Service, Inc., are maintained by the street car personnel in one of the carhouses. The Carrollton carhouse, located on one of the two routes and adjacent to the other, is used for all repair work. The unit replacement system, which has been used in New Orleans for some time for street cars and buses, is being used effectively also for many parts of the trolley buses.

At the corner of Main and Gay Streets in Knoxville is a car depot through which most of the street cars loop before starting back to the main business district. The building has several tracks for the storage, inspection and cleaning of cars, one of these being converted for the use of trolley buses. All inspection, light repairing and cleaning of these vehicles are conducted at this point. When major repairs are necessary the vehicles are taken to the Magnolia Avenue shops.

At present the six trolley buses of the Detroit Department of Street Railways are being taken care of at the Coolidge carhouse, a little more than a mile north of the Plymouth Road line. The vehicles are stored in the open but major repairs are made in the carhouse. Plans for a new building, to be constructed for the exclusive use of trolley buses, are now under consideration.

Brooklyn's two trolley buses are being stored and maintained at the Ninth Avenue Car Depot, located a little more than 1½ miles from the line. The vehicles are towed between the depot and the line by a truck.

In Philadelphia, Rochester and Cohoes the trolley buses are also being maintained at carhouses. No special difficulties have arisen in any of these cities, and the methods for each are now well standardized.

TIE-BORING

Survey of 34 electric railways and steam railroads shows increase in use of screw spikes, more companies boring holes for cut spikes and extensive practice of treating ties. The majority bore holes through ties rather than part way

Practices Analyzed

ALTHOUGH there are certain trends toward standardized practices in the preparation of ties for use in track construction, there are wide differences of opinion among both electric railway and steam railroad track men as to which are the best. Requirements vary so greatly in different parts of the country and for the several classes of service that specifications are bound to differ in many particulars.

To determine the practices of several representative railways, the wood preservation committee of the A.E.R.E.A., way and structures division, under the chairmanship of C. A. Smith, superintendent of roadway Georgia Power Company, recently made a survey of tie boring methods in use. Results of this study, showing the type of spike, specifications for spike holes and treatment of ties of nineteen electric railways and fifteen steam railroads are summarized in the accompanying table. This tabulation shows that, although cut spikes still predominate, more companies are adopting the screw type of spike, that holes are being bored in ties for all screw spikes and for cut spikes on many systems, that the majority boring ties, drill all the way through and that practically all of the companies use preservatives.

Analyzing the types of spikes used, it is found that of the companies surveyed nine electric railways and twelve steam railroads use cut spikes entirely, five electric railways use screw spikes predominantly, and five electric railways and three steam roads use both types. In Boston, screw spikes are used on the elevated structures, in subways and tunnels, and on T-rail track in private right-of-way. Cut spikes are used for all other track. The screw spike and clip fastening is standard for straight track construction of the Chicago Surface Lines, while hook-head cut spikes are used in special trackwork installations. Since 1928, the Cleveland Railway has been using the screw spike and clip on practically all track constructed with the 122-lb. grooved girder rail. The Indianapolis Street Railway decided last year on the adoption of treated ties, plates and screw spikes for standard track construction. In Toronto, tie plates and screw spikes with clips are used for special track work, while cut spikes are used for straight track construction.

On its main line the Delaware, Lackawanna & Western Railroad uses a double-shoulder tie plate with cut spikes at the base of the rail and screw spikes to hold the tie plates rigidly to the tie. This type of construction was adopted after many years of study and use with both types of spikes. On all branch lines this railroad uses screw spikes exclusively with a special tie plate.

Only eight companies reported that they do not bore the ties for receiving spikes. All of these were electric railways. It is interesting to note that all fifteen steam railroads and three electric railways bore holes for cut spikes. This is an important variation from the older practice of driving the spikes directly into the tie. With the exception of the United Railways & Electric Company of Baltimore, all of the railways boring holes for cut spikes drill all the way through. Baltimore does not bore the hole all the way through because of an experience a number of years ago when screw spikes were used. It was found after a few years that the spikes were almost entirely eaten up by corrosion or electrolysis. This was attributed to a rust streak. Of the ten companies boring holes for screw spikes, four drill all the way through and six part way. Considering the practice for both kinds of spikes, a majority favor drilling the holes all the way through.

The following reasons are given by the advocates of boring all the way through the ties:

1. Since the hole is accessible from either side, maximum opportunity is given for the preservative to enter the wood fiber during the treating process. When holes are bored part way, an air pocket is formed at the bottom, preventing the preservative from entering the full depth.

2. The through hole allows better drainage of moisture that enters through the top and which otherwise would collect in the pocket and cause both rust of the spikes and decay of the wood. It also prevents any accumulation of dirt which would hold moisture.

3. If ballast or other foreign matter enters the hole it can be driven through by the spikes, eliminating construction delays.

4. It prevents damage from freezing of water which might collect in the part-way-through hole.

5. Avoids shattering fiber on the under side of the tie, if holes are not deep enough or if foreign material enters the hole.

6. Prevents the possibility of the treating plant not boring deep enough and requiring further boring on the job, exposing untreated timber.

7. It is possible in laying the ties to use either face. Also, if it is desired to turn the tie over during reconstruction it is not necessary to rebore and treat the tie again.

8. It is easier to inspect the drilling of holes to make sure they agree with specifications.

Advocates of drilling the holes part way claim that the water which enters from the bottom of a hole bored all the way through causes more damage than the small amount of moisture that might enter from the top. In the case of open track construction, a great deal of water may be absorbed through pumping action. They also say that if the hole is of the proper diameter water cannot enter from the top. In Boston, holes are not bored through on the elevated structure, because a ground might result and interfere with the signal system. It appears that in paved track construction there is less likelihood of water entering the holes. The use of high-grade ties and proper size holes underneath a good paving structure should prevent damage from moisture. It is probably these reasons that account for electric railways adopting the part-way practice to a greater extent than the steam railroads, which use open track almost exclusively.

In Cleveland it was found necessary, using the 7-in. association standard grooved girder rail, to drill the two inside holes on an angle. This company has not been able to find any one who would pre-bore the inside holes on an angle and give assurance of having them located properly, so that all boring of ties is done at the yard. The holes are not bored all the way through, so they can be filled with hot creosote oil.

With the exception of three electric railways, all of the companies surveyed used ties treated with a wood preservative. This treating process is administered, in the case of companies boring holes all the way through, after the holes have been drilled. None of the companies boring part way through reported pre-drilling. Instead, the holes are bored in the treated ties and then filled with creosote oil.

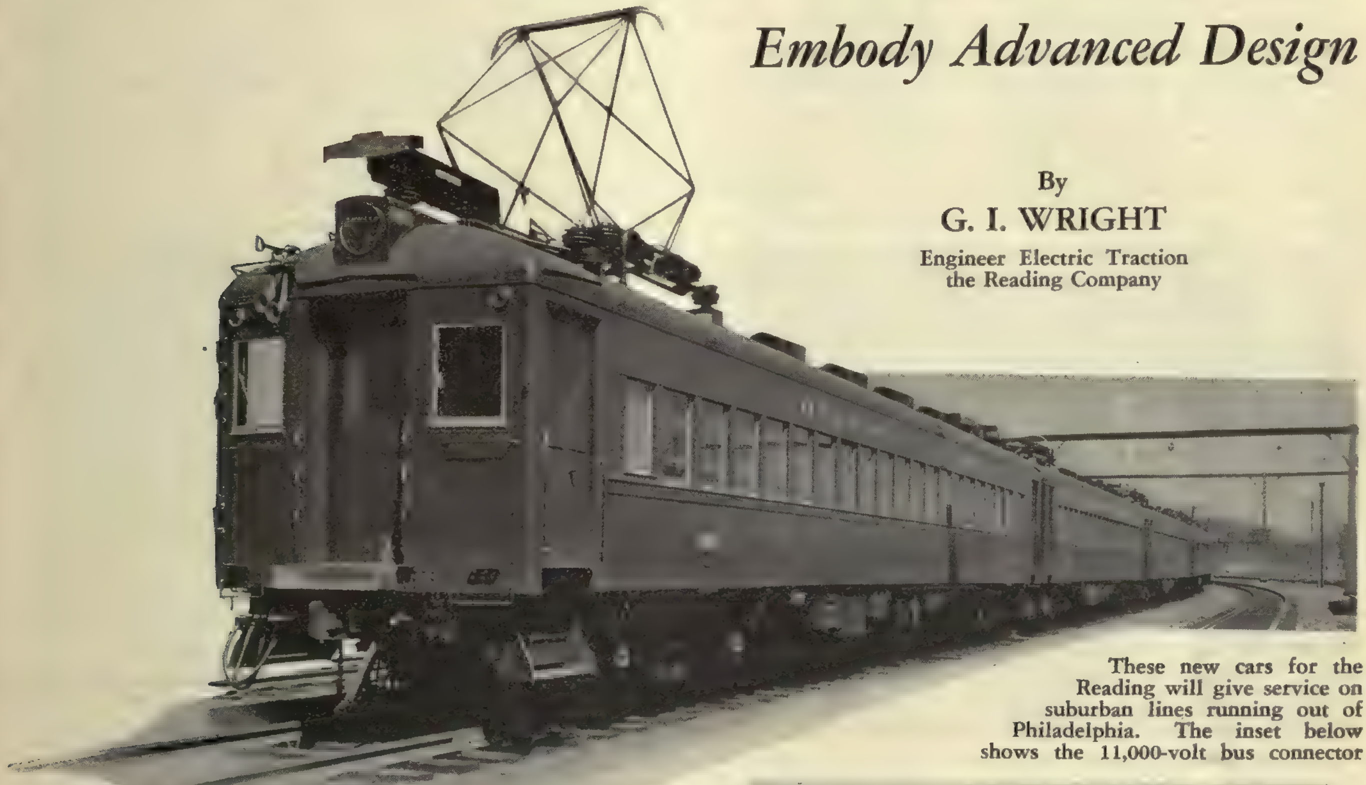
Tie Boring Practices of 34 Electric Railways and Steam Railroads

Electric Railway	Type of Spike	Spike Holes	Treatment of Ties
Birmingham Electric Co.	Cut.	None.	Creosoted.
Boston Elevated Ry.	Screw—Elevated structure, subways, tunnels and T-rail in private right-of-way. Cut—elsewhere.	Ballasted track, holes bored so that spikes will not reach bottom. On elevated, part way. None for cut spikes.	Fill part-through holes with creosote.
Chicago South Shore & South Bend R.R	Cut, except screw in Michigan City.	Bored through.	Impregnated after boring.
Chicago Surface Lines	Screw, straight track. Cut, special work.	For screw spikes. Bored through.	
Cleveland Ry.	Since 1928, using screw on practically all track with 122-lb. grooved girder rail.	Holes for screw spikes, bored part way. Inside ones bored at angle.	Creosote oil poured into holes.
Connecticut Co.	Cut.	None.	
Detroit Department of Street Rys.	Screw and cut on the few wood ties used.	Holes for screw spikes, bored part way.	White oak ties, untreated.
Eastern Massachusetts Street Ry.	Cut entirely.	No holes.	Ties are treated.
Georgia Power Co.	Cut.	No holes.	Ties are treated.
Illinois Terminal R.R. System	Cut chiefly. A few screw type.	Favor boring part way for screw spikes.	
Indianapolis Street Ry.	Adopted screw in 1930.	Bore through.	Red oak ties, treated after boring.
Lehigh Valley Transit Co.	Cut.	No holes.	Most ties not treated.
Memphis Street Ry.	Cut entirely.	No holes.	
Milwaukee Electric Ry. & Light Co.	Screw.	Bore 5½ in. in 6-in. ties.	Ties are treated.
Philadelphia Rapid Transit Co.	Screw and cut.	Favor boring through entire thickness.	Most ties untreated.
Pittsburgh Rys.	Cut.	No holes.	
Third Avenue Ry. System	Cut.	Bore holes entirely through.	Ties are creosoted after boring.
Toronto Transportation Commission	Cut for standard. Screws for special work.	For screw spikes bore holes part way. For standard track favor boring through.	Special work ties treated before boring, holes filled later. Other ties untreated.
United Rys. & Electric Co. of Baltimore	Cut.	Bore holes part way.	
Steam Railroad			
Atchison, Topeka & Santa Fe Ry.	Cut.	Bore holes entirely through.	Ties are treated.
Atlanta & West Point R.R.	Cut.	Holes are bored through.	Ties are treated.
Baltimore & Ohio R.R.	Considering use of cut to hold rail and screw to hold tie plate to tie.	May adopt practice of boring holes. Would bore entirely through.	Treated ties used.
Boston & Maine R.R.	Cut.	Bore holes through.	Treated ties used.
Chgo., Milwaukee, St. Paul & Pacific R.R.	Cut.	Bore holes through.	Ties treated after boring.
Chicago, Rock Island & Pacific Ry.	Cut.	Holes are bored through.	Ties are preserved.
Cleve., Cincinnati, Chgo. & St. Louis Ry.	Cut.	Bore holes through.	Treated ties used.
Delaware, Lackawanna & Western R.R.	Main line—cut at rail, screw for tie plate. Branch lines—screw exclusively.	Ties are bored through.	Ties are treated after boring.
Illinois Central System	Cut.	Bore through ties.	Preservative used after boring.
Lehigh Valley R.R.	Cut.	Favor boring through.	
Nashville, Chatanooga & St. Louis Ry.	Cut.	Holes are bored through.	Ties are creosoted.
New York Central R.R.	Cut.	Holes go through the tie.	Ties are treated after boring.
New York, New Haven & Hartford R.R.	Cut, diamond-pointed.	Holes are bored through.	Creosoted after being used.
Pennsylvania R.R.	Cut, except in some tunnels and bridges.	Bore holes through.	Preservative used.
Southern Ry. System	Cut.	Bore holes through.	Both plain and creosoted ties are used.

Cars for Reading Electrification

Embody Advanced Design

By
G. I. WRIGHT
Engineer Electric Traction
the Reading Company



These new cars for the Reading will give service on suburban lines running out of Philadelphia. The inset below shows the 11,000-volt bus connector

SEVENTY new multiple-unit motor cars will soon be placed in service by the Reading Company, inaugurating its Philadelphia suburban electrification to Lansdale, Doylestown, Hatboro and West Trenton. These cars are being built by the Bethlehem Steel Company at its Wilmington, Del., plant. It is estimated that 30 more cars will be required for the Chestnut Hill line and another 30 for the Norristown service, making a total of 130 for the complete electrification.

The cars are 72 ft. 11½ in. long over couplers, and without passenger load weigh approximately 126,500 lb., of which some 60 per cent is on the motor truck and 40 per cent on the trailer truck. The order of 70 cars will include 61 passenger cars seating 86, seven combination cars seating 62 and having a 17 ft. 1 in. baggage compartment, and two combination cars seating 38 and having a 16 ft. 8½ in. baggage compartment and a 17 ft. 1 in. railway postoffice space.

Each car is equipped with two 300-hp., 25-cycle motors, which are the largest ever built for this type of service on an 11,000 volt, single-phase line. Aluminum parts were used wherever practicable. The resulting saving in weight, along with the large capacity of the motors, results in high schedule speeds.

A number of new developments, all designed by the Reading Company, are a power bus line connector to save pantograph and trolley wear, a design of ventilating system to save cleaning and maintenance, a motor spring-nose suspension to facilitate changing of motors, a magnetic door latch and thermostat control to conserve heat, and a flexible air connection to the motors which is self-aligning and self-connecting. Each car is a complete unit, with a control cab at each end. Each is equipped with electro-pneumatic brakes and cab signals.

Careful study of economies due to weight saving was made, with the result that aluminum alloys were adopted for the following parts: Floor, roof, vestibule end, body end and saloon sheets; side and end linings; steps, treads and trap doors; parcel racks, heater guards, platform floor plates; door panels; conduits and fittings; headlights; motor-generator frame; switch group and relay boxes; bus connector parts. A reduction of 6,640 lb. per car was obtained at an added cost of $1,475. The corresponding estimated annual energy saving is $232, whereas the interest on the added investment is $74, making a net annual saving of $158 per car or $11,060 for the 70 cars.

The trucks, side sheets, underframing and all stress-carrying members are of steel. The center sill consists of two 9-in. channels with a ¼-in. top cover plate and a $\frac{7}{16}$-in. bottom cover plate extending between buffer sills. This center sill forms a duct to carry ventilating air from the blower to the motors. The roof is of the single-deck type covered with aluminum sheets and reinforced to carry a pantograph at one end and a bus connector at each end. Steel hood sheets were used due to the difficulty of shaping aluminum. Salamander hair insulation is used throughout.

The seating arrangement consists of 37 cross seats spaced on 33½-in. centers and three longitudinal seats, each seating four people. Each car has one toilet.

Signals are electrically operated by push buttons and there are no signal or emergency cords within the car. The emergency cord is located in the vestibule, but is accessible from within the car. Push buttons for the conductor's signal buzzer are located two in the car body, one over each vestibule end door, and one under each corner post. The latter are provided so that while on the station platform the conductor can signal the motorman to start before boarding the train, thus saving stopping time. A Westinghouse double Pneuphonic horn is located on the vestibule hood at each end of the car.

Lighting is by eight dome fixtures with opal glass bowls, each using a 100-watt lamp. These are arranged in two circuits controlled from a panel in the vestibule. A Golden Glow fixed-focus headlight, using a 250-watt bulb, is built into each end hood so as to give a streamline appearance. A four-position switch in the motorman's cab gives him "off," "high," "medium" and "low" control of the headlight. Electric marker lamps are built into each corner of the car.

Taylor flexible trucks are used under 50 cars and Commonwealth trucks under the other twenty. Both have manganese steel pedestal and bolster liners to minimize wear. The motor truck has a wheelbase of 8 ft. 9 in., with 38-in. wheels on 6 x 11-in. axles, while the trailer truck has an 8-ft. wheelbase with 36-in. wheels on 5½x10-in. axles. Plate friction side bearings with 16½x4x⅝-in. hardened spring steel wear plates are used. All trucks are interchangeable. A spring nose support makes it possible to remove the motors without removing the truck from the car. The wheels may be dropped with the truck and motors in place, eliminating the necessity of disconnecting the motor leads when changing a pair of wheels. All of the trucks have plain journal bearings.

Westinghouse AMUE-1812 electropneumatic brakes are used. They are set for a braking rate of 1.5 m.p.h. p.s. The air compressor, with a displacement of 35 cu.ft. per minute, is driven by a 7½-hp., 105-volt single-phase motor, and is mounted on rubber pads to eliminate noise and vibration. Both types of trucks have clasp brakes. Considerable effort was devoted to the design of the brake system to prevent chattering and rough stops. It was decided not to use brake shoes that bear on the flanges to obviate the danger of cracking the wheels with the intense heat developed by frequent stops from high speeds at a high rate of retardation.

Each car is equipped with two 300-hp. single-phase motors of the compensated-series commutating-pole type, connected in series. Forty cars have General Electric GEA-620 motors, 28 have Westinghouse 423-B motors, and two have American Brown Boveri EDTM-544 motors. The motor characteristic curves are so matched that any combination of equipment will result in smooth train operation. All motors have roller armature bearings.

The motors were selected on the basis of the hardest service, that of the Chestnut Hill locals, with short runs and severe grades and curves. The average local run between Wayne Junction and Chestnut Hill is 0.57 mile, with a compensated grade and curve resistance of 18.2 lb. per ton. The maximum safe speed with new wheels is 72 m.p.h. The motors represent radical improvements over previous designs and have high efficiency and power factor, with low weight per horsepower and excellent commutation. It is hoped that maintenance costs will reflect these improvements.

The main controller, located under the car, is of the automatic accelerating type, and is remotely controlled through a 32-volt circuit from a master controller in the cab. A current limit relay gives an accelerating rate of 1.25 m.p.h.p.s. up to about 27 m.p.h. The master controller has three notches, low-speed switching, slow running and full running. It also has the dead-man release, and a pedal so that the motorman can hold it in any position and have both hands free. Westinghouse control is used on 66 cars, General Electric and American Brown Boveri on two each.

At each end of the car are two twelve-point train line jumpers, so arranged that the cars can be coupled from either side of the train. Dummy receptacles hold the free ends of the jumpers when not in use. The high-voltage circuit is protected by a pantograph lowering relay. The motor circuits are guarded against faults and wheel slipping by a differential protective relay.

Car heating is with 40 heaters located under the seats. Each has two 325-watt open-coil elements. There are two circuits with one coil of each heater in each circuit. Ten coils are connected in series on 360 volts. Double thermostat control is so arranged that when the motorman has his plug in the master controller the setting is for 65 deg. F., and when the plug is out the setting is 50 deg. A "train heat" switch permits him to change from the 65-deg. setting to the 50-deg. setting at will. The cars will thus reach a medium temperature in the yards before going into service. As the motorman must be in his cab several minutes before time for departure, the change in setting when he plugs into the master controller will allow the train to become warm before starting. Operating rules will require the train heat switch to be cut down to the 50-deg. setting a short time before reaching a terminal, unless the equipment is to remain in service. This should save considerable energy.

Magnetic door latches will hold the body end doors open while the train is standing in a station, but will release them as soon as the train starts. An air cushion door check will then close each door. It is believed this will save considerable heat, as the cars are not fitted with diaphragms, and with short runs it is impossible for the trainmen to keep the side and trap doors closed.

Each cab has a 1,000-watt, 105-volt heater supplied from the same transformer tap as the air compressor. It is placed horizontally under the foot rest so that the motorman can keep his feet warm.

At each end of the car is a motorman's cab with complete control equipment. All cars are equipped with cab signals, but do not have the automatic stop and speed control features. The motorman will have his color indicator in the right-hand corner of the cab about on a level with his face.

Shatterproof glass is used in the motorman's window, and a "Hays Air Push" wiper keeps it clear of water and snow. On the left side of the cab is a gang of eight toggle switches which control cab heat, train heat, vestibule lamps, etc. A drop sash in the side door gives ventilation and permits the motorman to look out to the rear.

Special attention has been given to the design of a ventilating system to give under all conditions the 4,000 cu.ft. per minute of air needed to ventilate the motors, transformer and reactor coils. A carefully designed intake and filter keep down the velocity of the air and exclude moisture and dirt. The air is carried from the blower to the motors through the center sill of the car, avoiding the use of a large amount of piping. A secondary intake between the filter and the blower wheel will open automatically should the filter system become plugged with snow, ice or dirt, and will close automatically when the filter is cleaned.

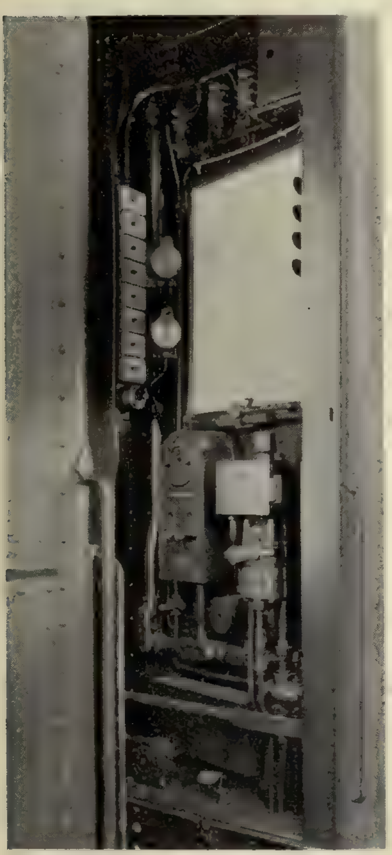
A flexible connection carries the air from the center sill to the motors. It is so designed that it automatically disconnects itself when a motor is removed. When the motor is replaced the connection is automatically restored without any effort on the part of a workman.

A "no-blower cut-out" interrupts the control circuit and cuts out the car motors in the event of a blower failure, making the particular car inoperative unless its blower system is functioning. For shop testing, a switch by-passes the no-blower cut-out when the control box cover is removed.

The "blower-generator" set is driven by a 15-hp., 360 volt motor. It is mounted on rubber bushings to minimize noise and vibration. This motor is started three-phase by cutting in a resistance which is opened by a contactor when the motor comes up to speed. An 1,800-watt d.c. generator, forming part of this machine, supplies energy for the 32-volt control and lighting system. A fifteen-cell 70 amp.-hr. lead battery floats on the line, while a regulator keeps the generated voltage within the narrow range required by the cab signals.

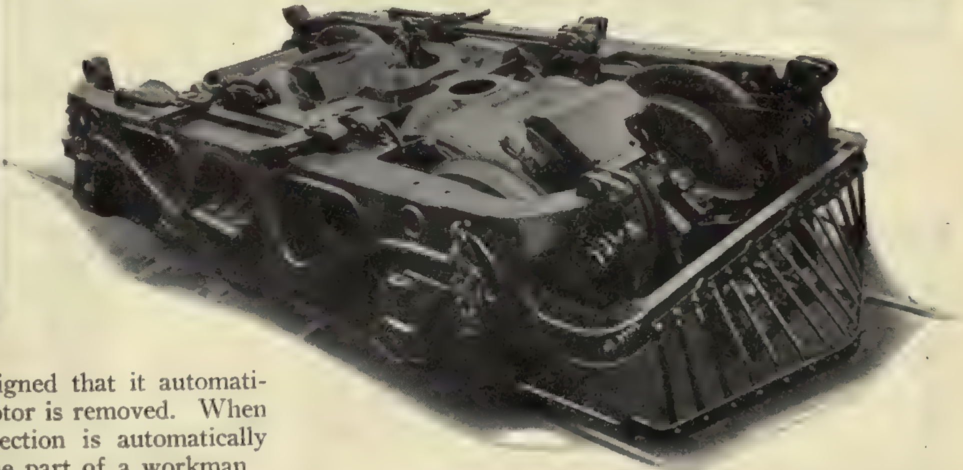
One single-shoe pantograph per car is mounted directly over the motor truck. Steel contact strips will be used initially, but it is planned to experiment with other materials later. No grease is to be used on the pantograph since there will be steam operation under the overhead system.

An 11,000-volt power bus connector mounted on each end of each car and operated by compressed air makes it possible to run trains up to ten cars in length with only two pantographs up, saving wear on the overhead system and pantographs, and minimizing the number of pantographs wrecked by getting caught in the overhead. It is planned to have two pantographs up in trains of two or more cars in order to reduce the arcing at the shoe by providing two parallel paths for the current. Each shoe will average about 60 amp. at 11,000 volts during the straight-line acceleration.



Left—All control equipment, including cab signals, is grouped conveniently for the motorman

Right—The car interior is finished in three-tone gray, striped in blue and gold, with sanded nickel finish hardware. Brass window sash and Flexolith flooring also are features



Below—The truck design is such that the axles may be dropped out without removing the trucks or motors from under the car

Comfort of the passengers, speed and ease of operation, elimination of weight, reduction of maintenance costs, accessibility and reliability of apparatus are the things which were kept in mind in the design of this car equipment.

The design of these cars represents the co-ordinated efforts of the mechanical and electrical traction departments of the Reading Company, with R. A. Hardy, head car draftsman, office of superintendent of motive power and rolling equipment, in charge of the mechanical design, and W. H. Smith, assistant engineer, office of engineer electric traction, in charge of the electrical design.

Trend of
REVENUES *and* EXPENSES

Monthly figures for past year compared with figures for corresponding months of preceding year

PRESENTATION of monthly statistics of gross revenue, operating expense and net earnings for a selected group of electric railway properties is begun in a new form in this article. Early in 1929 the JOURNAL commenced the regular publication of revenue and expense statistics. Since it was desired to show the trends of the transportation business only, care was taken to include only such reports as covered the financial results of operation of electric railway and bus service and to exclude joint operations of railways with other utilities. To this group was added later a number of electrified railroads which are devoted largely or entirely to suburban passenger service.

Heretofore the figures have been presented simply for the current month and for the same month of the preceding year, or for a period of several months immediately preceding and for the same period the year before. In order to determine the trends as shown by the monthly reports it has been necessary for the reader to compare the current monthly report as published with the figures given alongside for the corresponding month of the preceding year. To compare other months it has been necessary to refer to previous issues of the JOURNAL.

In order to make it possible for the reader to obtain trends with greater facility, it has been decided to change the form of presentation of those reports which are regularly available each month, and to include the principal figures month by month for at least a year, along with the per cent of increase or decrease from the corresponding month of the previous year. In this way the reader is able to see at a glance the trends and to make comparisons between various properties and different sections of the country. This has necessitated a radical change in the form in which the reports are presented, and has made it necessary to omit certain portions of the

Trend of Revenues and Expenses by Months

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease PerCent*
Boston Elevated Railway, Boston, Mass.						
Mar., 1930....	2,987,744	*4.65*	2,123,571	*3.22*	178,957	*2.85*
Apr..........	2,813,083	*3.54*	2,073,580	*0.96*	54,281	*61.3*
May..........	2,824,945	*5.17*	2,084,708	*2.50*	45,824	*69.2*
June..........	2,550,775	*3.93*	1,937,134	*3.05*	*113,749*	*252.1*
July..........	2,371,152	*5.04*	2,108,071	0.61	*424,295*	*48.5*
Aug..........	2,280,322	*7.81*	2,113,183	*1.55*	*531,494*	*46.9*
Sept..........	2,470,918	*3.78*	2,091,718	0.52	*316,296*	*59.9*
Oct..........	2,811,399	*4.04*	2,157,474	*1.29*	*35,272*	*64.9*
Nov..........	2,579,899	*10.33*	2,066,206	*2.56*	*185.317*	*389.5*
Dec..........	2,850,330	*8.20*	2,178,896	2.24	*20.516*	*107.1*
Jan., 1931....	2,840,159	*8.43*	2,082,456	*26.2*	57,600	*70.6*
Feb..........	2,534,828	*8.33*	1,952,032	*5.23*	*114,127*	*733.0*
Mar..........	....	.....	....	.....	....	.....
Brooklyn-Manhattan Transit System, New York, N. Y.						
Mar., 1930....	5,153,556	39.3	3,596,977	22.72	849,685	19.11
Apr..........	5,074,571	23.82	3,578,817	23.35	802,168	51.1
May..........	5,229,829	21.65	3,600,727	22.46	929,201	35.4
June..........	5,070,028	21.6	3,591,743	20.90	776,745	28.77
July..........	5,003,577	*2.86*	3,608,741	*6.06*	720,302	18.55
Aug..........	4,727,623	*4.39*	3,558,841	*6.64*	465,144	*14.91*
Sept..........	4,834,251	*2.49*	3,453,431	*4.52*	667,323	6.20
Oct..........	5,036,775	*2.58*	3,572,553	*4.22*	758,817	2.78
Nov..........	4,769,083	*4.37*	3,366,923	*6.98*	689,470	2.34
Dec..........	5,065,484	*2.56*	3,546,963	*4.25*	814,788	2.04
Jan., 1931....	4,852,706	*5.48*	3,475,330	*7.01*	674,029	*5.80*
Feb..........	4,453,655	*3.79*	3,159,903	*5.96*	583,468	2.40
Mar..........	5,028,562	*2.56*	3,475,847	*3.37*	814,360	*4.13*
Brooklyn & Queens Transit System, New York, N. Y.						
Mar., 1930....	1,970,570	*4.88*	1,645,111	*8.68*	224,761	36.6
Apr..........	1,936,880	*3.18*	1,644,070	*7.55*	195,127	63.4
May..........	2,030,966	*4.65*	1,615,294	*7.31*	310,865	9.11
June..........	1,968,238	*2.41*	1,603,996	*8.02*	257,482	18.78
July..........	1,917,118	*6.15*	1,603,893	*7.10*	203,433	*4.15*
Aug..........	1,827,238	*6.45*	1,595,256	*7.11*	120,864	*8.15*
Sept..........	1,887,499	*4.66*	1,564,271	*5.65*	213,728	*2.66*
Oct..........	1,922,388	*5.20*	1,597,166	*5.50*	214,924	*7.74*
Nov..........	1,820,498	*5.65*	1,522,735	*7.58*	187,822	5.20
Dec..........	1,920,463	*4.40*	1,560,950	*6.11*	250,893	6.06
Jan., 1931....	1,849,644	*6.18*	1,541,235	*7.58*	197,355	3.02
Feb..........	1,704,677	*3.98*	1,416,192	*5.40*	176,217	2.58
Mar..........	1,941,078	.....	1,602,862	.....	227,472	1.21

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease PerCent*
Capital Traction Company, Washington, D. C.						
Mar., 1930....	353,563	*8.31*	279,879	*2.27*	45,692	*36.6*
Apr..........	375,237	*1.51*	290,560	*1.54*	57,675	*15.73*
May..........	369,413	*5.11*	285,970	*3.10*	53,985	*16.72*
June..........	340,623	*5.25*	271,761	*3.80*	40,884	*16.70*
July..........	306,527	*9.02*	272,490	*4.65*	4,935	*78.5*
Aug..........	314,513	*3.48*	268,561	*4.09*	16,103	2.62
Sept..........	327,713	*7.06*	268,066	*1.61*	30,259	6.78
Oct..........	374,646	1.22	288,351	*1.48*	58,638	17.6
Nov..........	346,054	*2.70*	273,481	*1.54*	42,659	*11.05*
Dec..........	369,885	*1.77*	274,221	*3.21*	67,651	0.61
Jan., 1931....	347,491	*3.06*	280,514	*3.30*	37,705	5.11
Feb..........	312,815	*3.47*	252,080	*5.68*	30,521	*1.87*
Mar..........	....	.....	....	.....	....	.....
Chicago Surface Lines, Chicago, Ill.						
Mar., 1930....	4,792,936	*12.5*	4,529,014	6.54	484,312	*47.5*
Apr..........	4,981,987	*7.42*	4,077,371	*2.02*	764,786	*10.75*
May..........	5,012,190	*6.39*	3,986,513	*4.11*	831,499	*7.91*
June..........	4,766,687	*6.89*	3,835,838	*4.49*	776,880	*7.48*
July..........	4,535,460	*10.05*	3,807,075	*7.10*	649,307	*19.05*
Aug..........	4,488,146	*12.20*	3,796,705	*8.06*	680,219	*15.82*
Sept..........	4,568,564	*9.50*	3,789,472	*4.40*	713,323	*12.94*
Oct..........	4,879,570	*10.79*	3,933,416	*7.35*	799,118	*11.69*
Nov..........	4,537,647	*13.48*	3,769,538	*6.86*	712,177	*20.77*
Dec..........	4,846,000	*8.09*	3,984,572	*9.89*	767,348	*15.67*
Jan., 1931....	4,576,133	*12.65*	3,825,964	*5.37*	718,129	*21.00*
Feb..........	4,234,704	*10.90*	3,665,038	*6.04*	601,726	*15.4*
Mar..........	....	.....	....	.....	....	.....
Department of Street Railways, Detroit, Mich.						
Mar., 1930....	2,032,503	*16.79*	1,741,742	*15.17*	149,881	*43.6*
Apr..........	1,994,861	*14.80*	1,727,974	*12.47*	138,595	*44.6*
May..........	1,974,359	*16.21*	1,608,353	*17.80*	243,875	*10.54*
June..........	1,787,953	*18.50*	1,511,572	*14.43*	159,027	*46.4*
July..........	1,549,503	*27.4*	1,452,871	*14.20*	*41,888*	*113.6*
Aug..........	1,516,209	*29.1*	1,426,941	*16.67*	*52,773*	*118.4*
Sept..........	1,510,161	*26.3*	1,436,175	*12.59*	*51,711*	*119.2*
Oct..........	1,579,476	*25.84*	1,458,238	*14.91*	22,933	*91.8*
Nov..........	1,481,136	*23.35*	1,333,571	*13.38*	4,890	*97.8*
Dec..........	1,610,179	*22.59*	1,440,503	*21.67*	23,052	*77.8*
Jan., 1931....	1,550,656	*28.54*	1,421,575	*20.95*	12,759	*91.4*
Feb..........	1,431,468	*25.58*	1,323,683	*18.96*	*28,309*	*118.1*
Mar..........	1,696,308	*16.58*	1,415,021	*18.68*	133,347	*11.0*

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*Decreases or deficits are shown by *italic figures.*

information which previously have been included. The new tables present the gross operating revenue, the operating expenses and taxes, and the net income, along with the per cent of increase or decrease of each. Some twenty companies are included, and it is hoped to expand the service to include as many companies as will make their reports public in this manner. It is planned to continue the presentation month by month in this form, the latest figures being added to the tabulation each time and the oldest figures being dropped.

Since the revenues and expenses are the items of major importance they form the principal basis of comparison. Their movement from month to month and from year to year is a reflection of the state of the business and of the ability of the management of each property to meet the conditions imposed on it.

Net income, which is the resultant surplus after meeting operating expenses and charges, unlike the other figures, does not move along such stable lines. It represents the result of two conflicting trends—the fluctuations in gross revenue and in the results obtained by the management in meeting the demands imposed by such fluctuations. Coupled with this is the influence of any change in charges due to the variation in rates from time to time or by the issue or retirement of obligations. Hence, the net income is subject to much wider fluctuations than either the revenues or the operating expenses. Furthermore, since the charges usually are on an annual basis, it is the practice of many companies to allocate them approximately by months and then make an adjustment in the month when the actual figure for the period is obtained. Accordingly, the figures for net income are likely to be less stable than those for revenues and expenses. They do, however, form a guide as to the

Trend of Revenues and Expenses by Months *(Continued)*

Eastern Massachusetts Street Railway, Boston, Mass.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	711,460	*3.92*	479,649	*1.21*	159,907	*30.4*
Apr.	651,636	*9.02*	446,282	*3.06*	47,051	*53.03*
May	663,941	*7.87*	451,941	*8.04*	53,076	*34.2*
June	619,456	*9.64*	435,292	*6.43*	28,672	*58.4*
July	617,220	*10.11*	461,048	*7.27*	3,926	*91.22*
Aug.	624,332	*9.42*	444,429	*10.33*	28,399	*52.0*
Sept.	o12,237	*7.12*	448,470	*0.88*	21,771	*70.8*
Oct.	623,872	*8.48*	467,773	*4.92*	15,811	*71.9*
Nov.	590,856	*10.90*	449,032	*1.60*	205	*97.62*
Dec.	670,964	*12.08*	516,913	1.71	20,841	*84.0*
Jan., 1931	700,961	*7.63*	472,079	*2.88*	36,145	*56.3*
Feb.	639,344	*6.62*	434,904	*2.83*	33,058	*50.9*
Mar.	....	.....	....	.....	....	.....

Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	81,589	*8.50*	69,327	*2.83*	*13,265*	*12.45*
Apr.	71,000	*13.68*	65,916	*5.54*	*21,343*	*19.65*
May	79,126	*6.80*	65,512	0.0	*13,182*	*32.2*
June	72,865	*15.19*	65,324	*25.80*	*12,940*	*172.9*
July	60,907	*21.02*	64,134	*11.58*	*24,217*	*110.0*
Aug.	64,592	*18.82*	62,484	*8.19*	*12,690*	*36.45*
Sept.	72,267	*11.61*	63,549	*5.42*	*8,497*	*435*
Oct.	75,708	*17.80*	66,353	*0.59*	*18,447*	*227*
Nov.	72,024	*13.82*	66,314	*0.23*	*21,171*	*158.3*
Dec.	....	.....	....	.....	....	.....
Jan., 1931	79,764	*15.78*	67,438	*7.38*	*13,133*	*236*
Feb.	....	.....	....	.....	....	.....
Mar.	....	.....	....	.....	....	.....

Galveston-Houston Electric Railway, Houston, Tex.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $ †	Increase or Decrease Per Cent* †
Mar., 1930	42,390	*14.80*	28,956	*6.15*	*59,154*	*117.1*
Apr.	41,348	*12.15*	27,417	*10.00*	*61,938*	*106.5*
May	41,686	*15.21*	27,945	*12.21*	*65,653*	*101.8*
June	45,659	*20.34*	28,273	*10.93*	*74,054*	*114.5*
July	46,757	*9.65*	29,248	*3.52*	*78,159*	*123.5*
Aug.	47,425	*11.42*	28,402	*8.12*	*82,135*	*146.1*
Sept.	42,823	*16.49*	28,052	*14.83*	*84,893*	*144.2*
Oct.	....	.....	....	.....	....	.....
Nov.	36,974	*12.49*	44,183	*65.2*	*93,685*	*126.9*
Dec.	36,166	*15.00*	27,949	*1.79*	*99,343*	*112.9*
Jan., 1931	33,291	*20.15*	25,057	*9.18*	*105,000*	*110.4*
Feb.	32,281	*19.80*	22,990	*9.64*	*111,369*	*110.0*
Mar.	....	.....	....	.....	....	.....

Houston Electric Company, Houston, Tex.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $ †	Increase or Decrease Per Cent* †
Mar., 1930	274,515	*8.28*	194,809	*4.40*	623,313	*73.0*
Apr.	261,403	*6.81*	188,034	*3.62*	615,008	33.9
May	262,653	*8.60*	194,968	*1.94*	597,837	*4.56*
June	247,461	*11.67*	179,084	*10.27*	589,240	*6.38*
July	247,070	*10.86*	176,909	*11.82*	584,163	*1.24*
Aug.	244,033	*12.41*	177,452	*10.89*	573,872	*4.18*
Sept.	251,919	*9.00*	175,905	*10.42*	571,857	*5.84*
Oct.	267,306	*7.57*	181,499	*10.67*	573,425	*4.16*
Nov.	247,210	*10.00*	176,739	*1.96*	550,635	*9.55*
Dec.	258,219	*9.84*	180,678	*0.68*	524,458	*16.64*
Jan., 1931	242,554	*10.52*	176,792	*11.08*	518,843	*17.70*
Feb.	223,256	*14.11*	163,249	*12.96*	507,328	*20.2*
Mar.	....	.....	....	.....	....	.....

Hudson & Manhattan Railroad, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	1,078,807	*1.04*	531,327	*2.72*	212,760	1.83
Apr.	1,063,729	*0.21*	515,470	*1.85*	213,380	9.06
May	1,039,637	*2.79*	509,707	*3.06*	194,759	*2.49*
June	989,627	*1.69*	499,396	*1.74*	154,985	*4.49*
July	954,538	*3.12*	502,515	*1.61*	116,747	*15.77*
Aug.	934,204	*5.65*	499,806	*3.98*	98,977	*26.28*
Sept.	974,433	*2.80*	506,845	0.23	132,332	*19.02*
Oct.	1,033,584	*4.33*	521,325	*1.97*	176,999	*17.8*
Nov.	994,735	*6.18*	489,761	*4.08*	169,465	*21.42*
Dec.	1,060,614	*4.66*	419,109	*17.40*	306,321	12.07
Jan., 1931	1,005,022	*7.62*	512,350	*7.23*	157,098	*21.37*
Feb.	936,542	*5.67*	467,137	*6.09*	134,717	*16.34*
Mar.	1,013,577	*6.05*	497,695	*6.34*	180,554	*15.10*

Illinois Terminal Company, Springfield, Ill.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	579,969	*3.66*	424,086	*1.60*	111,120	*20.04*
Apr.	590,334	*1.55*	423,704	*5.90*	131,438	19.13
May	608,403	*4.65*	427,471	*2.78*	142,226	*10.42*
June	566,548	*8.98*	444,638	0.00	86,421	*36.0*
July	601,515	*11.03*	475,856	*3.24*	87,602	*35.7*
Aug.	661,520	*7.65*	466,816	*12.07*	152,827	12.15
Sept.	654,477	*5.26*	454,81[illegible]	*9.66*	160,897	14.62
Oct.	691,672	*2.54*	506,107	*2.41*	148,701	11.61
Nov.	542,672	*11.02*	430,907	*6.24*	80,529	*23.1*
Dec.	577,425	*13.69*	421,987	*14.26*	127,588	5.66
Jan., 1931	509,641	*20.77*	395,953	*19.80*	87,742	*9.83*
Feb.	498,067	*5.89*	388,126	*3.82*	84,381	2.26
Mar.	....	.....	....	.....	....	.....

Interborough Rapid Transit Company, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	6,436,421	2.44	4,164,759	9.60	*199,385*	*129.1*
Apr.	6,276,781	2.03	4,109,557	9.63	*161,201*	*126.7*
May	6,287,149	0.41	4,095,439	9.22	*144,798*	*122.2*
June	5,832,071	1.85	4,027,730	10.58	*218,727*	*342.5*
July	5,382,547	*1.53*	4,078,983	2.52	*521,582*	*73.6*
Aug.	5,183,166	*4.59*	4,121,083	5.06	*763,482*	*172.7*
Sept.	5,684,267	0.17	3,983,368	7.78	*131,270*	*204.2*
Oct.	6,315,679	*1.13*	4,162,660	*0.83*	161,417	207
Nov.	5,965,365	*4.96*	3,869,340	0.0	*272,021*	*122.1*
Dec.	6,477,864	*0.52*	4,194,315	3.96	*293,152*	*47.4*
Jan., 1931	6,123,645	*4.42*	4,538,833	10.83	*348,972*	*66.0*
Feb.	5,570,354	*3.27*	3,653,798	*2.10*	*321,587*	*10.36*
Mar.	6,293,013	*2.24*	3,973,704	*4.61*	....	*6.65*

Jacksonville Traction Company, Jacksonville, Fla.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $ †	Increase or Decrease Per Cent* †
Mar., 1930	95,864	*10.18*	81,077	*8.26*	*65,995*	*39.2*
Apr.	91,163	*6.41*	80,115	*7.57*	*65,138*	*39.5*
May	89.731	*9.29*	80,106	*7.92*	*66,663*	*39.8*
June	79,087	*12.73*	77,848	*7.08*	*71,399*	*41.6*
July	78,772	*11.02*	77,787	*11.27*	*70,688*	*35.34*
Aug.	77,441	*12.1*	78,177	*13.82*	*68,188*	*19.92*
Sept.	78,529	*9.54*	75,012	*11.15*	*66,335*	8.16
Oct.	84,424	*12.50*	76,374	*13.72*	*65,525*	2.18
Nov.	81,250	*12.24*	69,437	*16.02*	*62,599*	0.15
Dec.	89,903	*11.47*	74,836	*11.49*	*63,204*	*4.62*
Jan., 1931	87,160	*8.08*	77,998	*13.67*	*58,133*	11.98
Feb.	76,205	*15.60*	75,462	*28.14*	*77,874*	*23.4*
Mar.	....	.....	....	.....	....	.....

Kansas City Public Service Company, Kansas City, Mo.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $ †	Increase or Decrease Per Cent* †
Mar., 1930	736,416	*7.75*	597,210	*1.57*	63,427	*49.7*
Apr.	715,707	*4.85*	602,031	*0.50*	39,101	*37.0*
May	719,705	*5.03*	594,064	*1.49*	45,132	*41.2*
June	656,292	*8.03*	562,308	*4.19*	6,396	*84.8*
July	635,205	*11.10*	573,990	*2.92*	*21,365*	*141.3*
Aug.	622,554	*13.17*	530,094	*11.41*	15,479	*64.3*
Sept.	650,114	*9.99*	524,324	*12.12*	50,261	*1.32*
Oct.	725,428	*4.89*	700,311	12.90	*60,435*	*190.8*
Nov.	706,577	*5.29*	572,066	*7.04*	58,994	*5.69*
Dec.	758,045	*1.73*	570,065	*14.58*	108,444	*284*
Jan., 1931	....	.....	....	.....	....	.....
Feb.	....	.....	....	.....	....	.....
Mar.	....	.....	....	.....	....	.....

Long Island Railroad, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	2,958,720	*0.28*	2,455,517	1.41	360,645	*24.45*
Apr.	3,123,136	*3.33*	2,449,645	0.09	523,097	*15.87*
May	3,346,650	*6.25*	2,542,463	*3.10*	632,246	*18.1*
June	3,662,765	*4.22*	2,512,947	*3.06*	994,868	*4.62*
July	4,018,939	*5.76*	2,668,042	*3.56*	1,180,528	*11.19*
Aug.	3,968,936	*5.21*	2,635,376	*5.06*	1,152,651	*6.58*
Sept.	3,589,671	*7.33*	2,467,056	*7.07*	928,655	*6.58*
Oct.	3,371,761	*5.80*	2,446,346	*8.97*	729,067	1.77
Nov.	2,954,624	*4.20*	2,249,258	*14.56*	483,180	89.2
Dec.	2,905,045	*6.60*	2,130,182	*16.27*	596,812	47.1
Jan., 1931	2,763,421	*5.65*	2,210,263	*9.65*	321,141	*6.0*
Feb.	2,561,169	*7.43*	2,074,216	*9.13*	332,002	*3.86*
Mar.	....	.....	....	.....	....	.....

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*Decreases or deficits are shown by *italic figures.*

†Net income is shown for the preceding twelve months.

Trend of Revenues and Expenses by Months (Concluded)

Market Street Railway, San Francisco, Cal.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	809,658	*1.28*	680,035	*1.61*	72,867	3.18
Apr.	798,970	*3.66*	637,121	*8.72*	76,480	11.0
May	792,536	*3.28*	675,407	*1.18*	61,527	*22.0*
June	743,277	*4.64*	646,615	*1.84*	42,297	*45.9*
July	735,453	*5.87*	649,901	*1.68*	32,534	*46.4*
Aug.	770,284	*6.69*	643,287	*5.46*	72,923	*16.56*
Sept.	745,298	*5.35*	626,770	*3.74*	64,731	*16.38*
Oct.	786,012	*6.73*	675,908	*6.49*	57,384	*45.6*
Nov.	729,407	*8.81*	615,613	*6.18*	60,457	*29.3*
Dec.	775,508	*5.12*	639,249	*5.52*	83,460	0.0
Jan., 1931	738,092	*5.55*	641,519	*4.83*	45,011	*12.31*
Feb.	668,931	*8.17*	576,661	*8.22*	41,002	*7.29*
Mar.	757,960	*6.40*	....	.....	72,828	0.0

New York, Westchester & Boston Ry., New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	208,434	4.70	139,502	*4.16*	157,515	3.16
Apr.	214,672	7.42	141,393	*10.06*	158,947	*0.98*
May	230,781	3.44	149,901	3.66	148,173	*7.86*
June	....	.....	....	.....	....	.....
July	224,469	*5.89*	146,233	*6.00*	152,633	*5.38*
Aug.	196,405	*10.53*	152,180	*0.41*	184,982	*22.4*
Sept.	203,617	*8.18*	165,256	6.57	192,861	*29.6*
Oct.	202,046	*7.52*	138,192	*14.1*	190,748	*20.81*
Nov.	184,690	*8.74*	170,542	2.52	216,451	*19.75*
Dec.	190,136	*12.31*	138,592	*17.80*	205,029	*16.75*
Jan., 1931	182,249	*13.76*	160,800	9.44	220,394	*32.4*
Feb.	161,311	*15.02*	149,571	*11.18*	222,308	*29.4*
Mar.	....	.....	....	.....	....	.....

Northwestern Pacific Railroad, Sausalito, Cal.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	406,807	*6.35*	476,912	*5.31*	73,821	*15.84*
Apr.	434,145	4.04	482,221	*3.74*	55,856	18.5
May	485,027	*9.33*	482,698	5.49	2,800	*103.81*
June	504,138	*4.31*	448,510	*3.76*	42,824	*29.3*
July	597,419	*2.54*	392,575	*18.52*	195,195	55.4
Aug.	638,476	*11.48*	415,502	*18.64*	210,115	4.03
Sept.	548,282	8.68	471,657	*3.78*	16,471	*83.5*
Oct.	555,867	*18.5*	534,858	4.44	7,447	*95.22*
Nov.	333,193	*27.7*	421,717	*16.33*	97,567	*120.9*
Dec.	312,319	*32.2*	465,220	*3.46*	158,491	*74.6*
Jan., 1931	283,852	*21.8*	401,656	*14.41*	123,928	*14.76*
Feb.	273,818	*27.4*	387,512	*12.96*	*122,531*	*68.9*
Mar.	....	.....	....	.....	....	.....

Staten Island Rapid Transit Company, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	188,807	*23.60*	172,481	*10.43*	*6,205*	*136.2*
Apr.	198,184	*9.46*	169,662	*11.10*	34,026	476
May	214,848	*20.61*	176,605	*9.84*	25,183	0.0
June	224,980	*18.31*	178,999	*10.17*	30,052	*30.6*
July	243,991	993	189,173	39.2	41,021	*35.1*
Aug.	233,371	*13.92*	168,110	*11.19*	49,486	*33.97*
Sept.	206,908	*15.93*	165,525	*4.87*	26,127	*60.8*
Oct.	205,631	*10.58*	167,586	*6.49*	29,723	*26.1*
Nov.	178,652	*17.42*	161,608	*0.58*	10,788	*80.4*
Dec.	178,474	*9.08*	160,715	47.3	5,997	*92.3*
Jan., 1931	170,387	*9.58*	158,982	*6.35*	*1,448*	*114.68*
Feb.	161,415	*13.58*	142,565	*9.20*	2,151	*93.5*
Mar.	....	.....	....	.....	....	.....

Third Avenue Railway System, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930*	1,252,562	*7.02*	1,048,297	*5.86*	8,270	*22.8*
Apr.*	1,236,554	*6.16*	1,026,448	*4.64*	12,657	*14.60*
May*	1,291,409	*6.92*	1,043,554	*7.63*	58,138	84.2
June*	1,244,961	*6.73*	1,018,619	*7.64*	45,078	1058
July	1,429,730	*5.18*	1,212,311	*8.54*	2,066	106.4
Aug.	1,350,064	*5.88*	1,180,853	*8.08*	*46,540*	28.4
Sept.	1,428,136	*3.48*	1,167,528	*8.36*	45,636	277.8
Oct.	1,456,688	*4.03*	1,205,455	9.73	36,257	317
Nov.	1,373,335	*5.37*	1,146,168	*10.17*	12,079	130.2
Dec.	1,438,752	*3.49*	1,197,249	*8.51*	26,250	108.7
Jan., 1931	1,393,054	*5.10*	1,178,797	*9.14*	*1,594*	96.33
Feb.	1,274,832	*4.27*	1,070,307	*8.56*	*11,143*	*126.2*
Mar.	....	.....	....	.....	....	.....

*Excluding buses.

United Railways & Electric Company, Baltimore, Md.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Mar., 1930	1,484,031	1.59	1,149,498	1.63	81,082	22.1
Apr.	1,449,416	1.82	1,117,959	1.23	67,093	53.0
May	1,457,181	*0.42*	1,125,365	*0.52*	73,214	13.05
June	1,332,275	*2.63*	1,043,008	*2.92*	35,318	4.76
July	1,236,414	*6.91*	964,582	*6.24*	14,358	*59.8*
Aug.	1,198,180	*8.34*	831,241	*18.41*	6,119	*71.5*
Sept.	1,261,734	*6.71*	995,805	*5.02*	10,050	*76.8*
Oct.	1,354,086	*7.28*	1,049,306	*4.84*	25,163	*71.2*
Nov.	1,263,811	*10.26*	983,047	*7.40*	9,200	*87.4*
Dec.	1,350,553	8.19	1,043,315	*7.25*	36,700	*54.6*
Jan., 1931	1,268,536	*10.90*	994,411	*11.89*	7,388	*69.3*
Feb.	1,136,604	*15.78*	891,421	*15.97*	*24,088*	*231.2*
Mar.	....	.....	....	.....	....	.....

*Decreases or deficits are shown by *italic figures*.

financial position of the company, and as such are valuable.

It is evident from the figures which are published on electric railway earnings that the business depression was not fully felt for the first few months of 1930. While many companies sustained small reductions in gross revenue, such losses were less than might have been expected following the good showing made in 1929. In fact, some companies actually showed a gain in gross during this period. As the year progressed it became increasingly evident that the depression was growing worse and that the losses in revenue were becoming steadily greater month after month. This trend is only now slackening. In amount the reductions in revenue varied on the different properties, but they have been general throughout the industry. Even the best properties have suffered.

Operating economies have been general. Although the past years had seen the introduction of modern methods that reduced expenses materially, and it was felt by leading operators that everything possible had been done along these lines, the past year has seen drastic retrenchment in the endeavor to minimize the effect of the losses in revenue. Such economies as have been introduced have been made with comparatively little adverse effect on the quality of service rendered. It is, of course, questionable whether the properties are being maintained as they should be. This may necessitate greater expenditures for deferred maintenance as soon as revenues warrant with returning prosperity.

Monthly and Other Reports

Calgary Municipal Railway, Calgary, Alta.

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
2 mo. end. Feb., 1931	133,635	95,490	....	......	*13,118*
2 mo. end. Feb., 1930	181,756	107,046	....	74,710	22,611

Edmonton Radial Railway, Edmonton, Alta.

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
February, 1931	60,638	43,006	....	17,631	*4,798*
February, 1930	75,916	45,917	....	29,998	2,771
2 mo. end. Feb., 1931	130,658	89,101	....	41,556	*4,302*
2 mo. end. Feb., 1930	161,151	98,939	....	62,211	5,098

Honolulu Rapid Transit Co., Honolulu, Hawaii

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
February, 1931	76,998	48,250	8,998	20,743*d*	10,286
February, 1930	82,620	51,782	8,819	22,969*d*	11,141
2 mo. end. Feb., 1931	161,246	99,891	17,996	45,329*d*	24,415
2 mo. end. Feb., 1930	169,477	106,289	17,638	47,739*d*	24,084

Lethbridge Municipal Railway, Lethbridge, Alta.

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
2 mo. end. Feb., 1931	7,097	6,744	....	353	*4,771*
2 mo. end. Feb., 1930	10,256	8,264	....	1,992	*3,179*

Regina Municipal Railway, Regina, Sask.

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
2 mo. end. Feb., 1931	60,379	45,239	....	15,140	*12,051*
2 mo. end. Feb., 1930	87,637	55,542	....	31,825	7,697

Saskatoon Municipal Railway, Saskatoon, Sask.

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
February, 1931	59,343	41,724	....	17,619	*5,365*
February, 1930	87,823	51,688	....	32,661	7,726

Mexico Tramways, Mexico City, Mex. (In pesos)

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
January, 1931	759,950	878,660	....	*118,710*	....
January, 1930	840,480	897,210	....	*56,730*	....
February, 1931	704,950	825,430	....	*120,480*	....
February, 1930	773,110	837,890	....	*64,780*	....
2 mo. end. Feb., 1931	1,464,900	1,704,090	....	*139,190*	....
2 mo. end. Feb., 1930	1,613,590	1,735,100	....	*121,510*	....

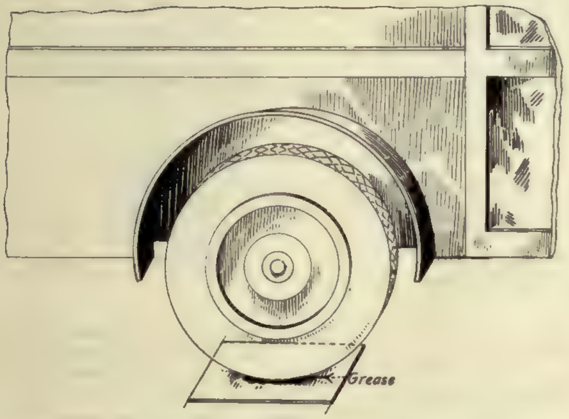
In the June Number

will be abstracted

Additional Annual Reports

which have become available since the publication of the financial review in the April number

PRACTICAL IDEAS for the *Maintenance Man*



A little grease on the sheet will make hard pushing unnecessary in replacing heavy bus wheels

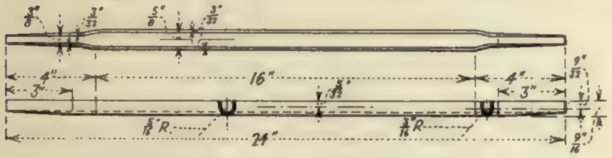
*Skid Plate for Replacing Bus Wheels**

BY FARRELL TIPTON
Electrician
San Diego Electric Railway

WHEN replacing heavy bus wheels on the axles much resistance is encountered because of the contact of the tire with the ground. To eliminate this resistance without the need of jacking the bus too high a piece of sheet metal, about 20x20 in., is placed on the ground beneath the axle and is covered with a thin layer of lubricating grease. The wheel will then encounter practically no resistance at the tire rim, and as a result it can be pushed on the axle with little effort.

*Protecting Sleeve for Trolley Ears**

BY R. J. RUSSELL
Pittsburgh Railways



Copper sleeves have increased the life of trolley ears on the Pittsburgh Railways

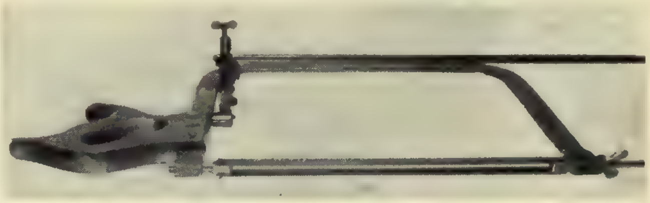
FOR several years the Pittsburgh Railways has been experimenting with a copper sleeve or trolley protecting armor to reinforce a line ear that is worn out in service and obviate its removal. In the development of this sleeve ease of installation and removal, cost and life as compared to a line ear were the important factors taken into consideration. As the result of these experiments a sleeve of the type illustrated was developed. The cost of the sleeve, including the cost of a die which was absorbed with the first order, is approximately two-thirds that of a new trolley ear, and naturally succeeding orders will be cheaper. The sleeve is attached to the trolley wire by clinching it for a distance of 4 in. at each end of the ear. It is removed by running a stripping tool through the clinched ends. The average life of the sleeve was found to be longer than that of the average line ear.

A substantial yearly saving has been made with the use of this sleeve. This saving was due to the difference in cost between the sleeve and line ear, the lower cost of labor for installation and removal and the longer life of the sleeve as compared to that of the line ear.

Double-Blade Hacksaw Gives Parallel Rail Ends

BY J. A. KRAMER
Department of Street Railways
Detroit, Mich.

MAJOR track repairs in Detroit, when new rail is not laid, are made by removing broken or badly worn rails and broken joints, sliding the remaining rails together and installing new rails at car stops where the wear is greatest. The joints are then welded with thermit, as are all rail joints in new construction.



Use of a double-blade hacksaw in Detroit has resulted in better thermit joints at lower labor cost

In order to make satisfactory thermit welds when repairing joints of this type, the abutting ends of the rail must be squared to obtain the necessary smooth surfaces for the use of an insert, or for tight butting of the rail ends when no insert is used. Using a single hacksaw there frequently was a variation in the angles of the two abutting cut ends. The inserts then had a tendency to work loose, or, when no insert was used, the resulting joint was frequently uneven.

In order to make the rail ends parallel, a double-blade hacksaw has been developed which cuts the two adjacent rail ends at the same time. This tool has effected a saving in the labor cost for sawing and also obviates any difference in the angles of the two cuts. It has been found that two men take approximately 40 minutes to make the two cuts with a single-blade hacksaw. With the double-blade saw these two cuts are made simultane-

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**Submitted in* ELECTRIC RAILWAY JOURNAL *Prize Contest.*

ously in practically the same time required for the single cut, saving half the labor.

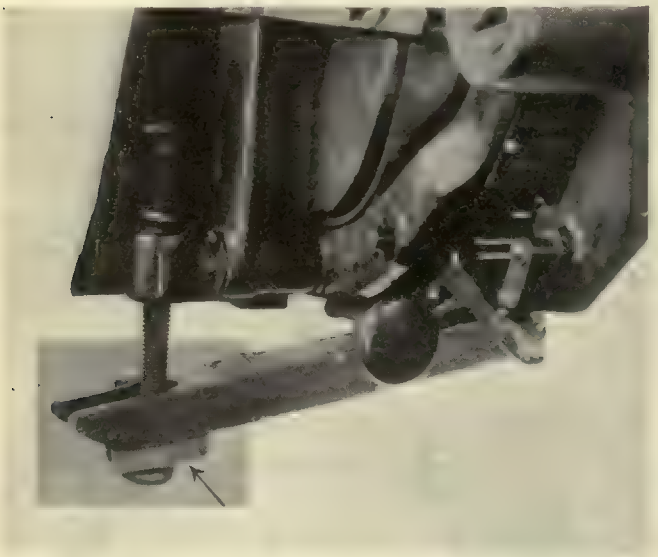
The double-blade hacksaw illustrated was made from an ordinary single-blade saw frame by removing the tension keys at each end and substituting heavier ones, $\frac{3}{8}$ in. thick, with pins at each side to hold the blades. These keys separate the two blades by $\frac{1}{2}$ in. Both blades are tightened with the same tension key, so that at all times there is uniform tension on the two blades.

*Circuit Breakers Reset Quickly With Calibrated Plugs**

By F. W. Braund

Superintendent of Power Conversion
Cleveland Railway

DIRECT-CURRENT circuit breakers controlling outgoing railway feeders, and likewise those protecting conversion or generating equipment, must obviously be set at tripping values in excess of peak-load demands. On the average electric railway the peak load is often two to three times the base load. To protect continuity of operation of the distributing station properly during off-peak periods the direct-current feeder circuit breakers should be reset at lower tripping values, for frequently the peak-load setting of but one feeder in a group will represent 75 per cent to 90 per cent of the capacity of one converter or generator which may be operated alone on the base schedule. To protect the conversion or generating equipment during off-peak periods without the necessity of recalibrating circuit breakers several times a day, a calibrating plug has been developed by the Cleveland Railway.



Red fiber plugs of varying thickness are used to readily set circuit breakers at lower tripping values during off-peak periods

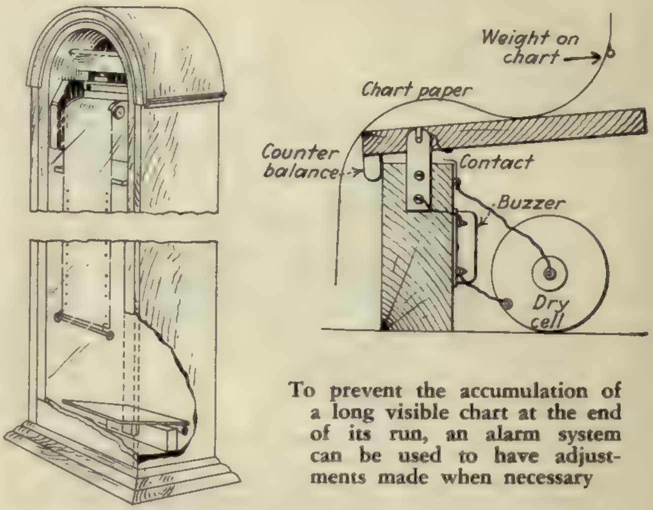
Peak-load setting, amperes	4,000	3,000	2,500	2,000	1,600	1,400
Thickness of plug, inches	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
Base-load setting, amperes	3,000	2,500	2,000	1,600	1,400	1,200

The plug is readily inserted under the breaker tripping armature, and any degree of recalibration can be obtained by the use of plugs of varying thickness, made of red fiber. The table indicates the thickness of the plugs and their effect upon the breaker setting when used in conjunction with the standard GE air circuit breaker, Type C, Form K-2, 650-volt, 2,000-amp.

*Recording Chart Alarm**

By Sidney Harris

Electrical Department
Toronto Transportation Commission



To prevent the accumulation of a long visible chart at the end of its run, an alarm system can be used to have adjustments made when necessary

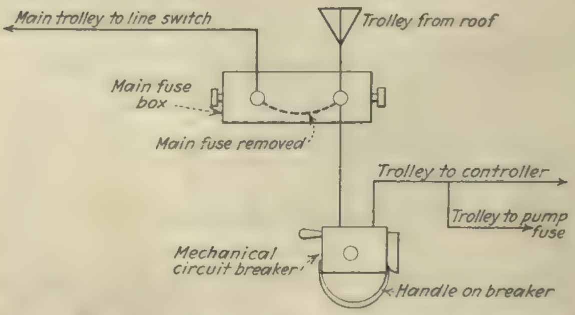
ON certain recording charts where it is desirable to have several feet of chart visible at all times, as shown in the illustration, it has been found desirable to replace the reroll with a weight hanging on the chart. At certain times of the day when a reduced office staff is on duty it is often forgotten to move the weight up the chart when it has run the fixed distance. An alarm device was developed to remind the person in attendance to rearrange the weight when it is necessary.

When the weight reaches the bottom of the case it rests upon a counterweighted platform depressing it so that electrical contacts are closed and a buzzer sounds until weight is removed from the platform.

*Portable Circuit Breaker Used to Run Disabled Cars to the Barn**

By R. W. James

Ottawa Electric Railway



Portable circuit breaker can be connected to a disabled car in about two minutes

FAILURE of line switches or line switch cables has been the cause of many pull-ins on the Ottawa Electric Railway. Often, in towing disabled cars to the carhouse, the draw-bars are bent, the bumpers are broken, and the car flashing is badly damaged. To prevent these damages and to avoid towing cars disabled because of defective line switches, a mechanical line switch has been developed to enable a repair man to put it on the car in the street. When a defective switch disables a car in service it is pushed by another car to the nearest loop or siding, and a repair man is dispatched with the mechanical circuit breaker to connect it to the car as quickly as possible and to run the car on its own power.

**Submitted in* Electric Railway Journal *Prize Contest.*

The circuit breaker can be connected to the disabled car in about two minutes. One lead of the circuit breaker is connected to the large side of the main fuse box after removing the fuse; the other lead is then connected to the trolley connection in the controller. There is a wire tapped from this connection which may be switched to the dead side of the compressor fuse block. If it is dark, a short wire can be run from the compressor fuse block to the light fuse. The car can be then safely operated as the air pressure and lights are available. When the car has been taken to the barn, the portable circuit breaker remains connected until the damaged circuits are repaired.

Troubles with Train Line Jumpers Reduced by Systematic Inspection

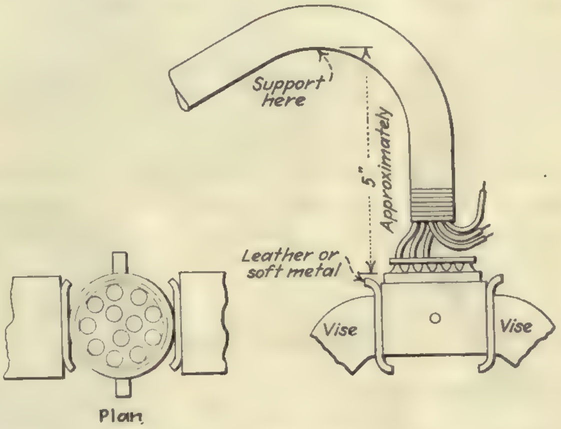
By G. L. Moses
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

SYSTEMATIC inspection and maintenance of train line jumpers and receptacles will keep the cost of maintaining these parts to a minimum and improve the reliability of multiple-unit cars in service. The jumpers unite the "nervous systems" of all the motor cars in a multiple-unit train, and enable one operator to control a number of cars as a unit. Failure of these jumpers or receptacles may render a train inoperative.

Jumpers which are in continuous service should be inspected regularly. Inspection periods of a month have been found satisfactory. Many operators mark the jumper castings with a dot of colored paint to indicate the period of inspection, each period having a color. The best method of inspecting removable jumpers is to have two receptacles mounted on a bench, wired to place all jumper circuits in series. Inspection is begun by passing 50 amp. through the jumper for three minutes. The inspector should move the cable to duplicate service conditions and watch the ammeter for changes in current. Any defects in the jumper, such as bad contacts, loose connections and broken conductors, will be indicated. An insulation test at 2,000 volts, a.c., 60 cycles, should be made from all conductors to the castings and between individual conductors.

Defective jumpers and receptacles should be taken apart by first removing the bolts holding the castings together. The castings can then be pulled apart. It may be necessary to heat the castings slightly with a blow torch to loosen the insulating gum. When the castings are removed from the cable and contact block assembly, the gum should be removed by chipping or melted off by pouring hot gum over it.

It is important that the quality of replacements be at least equal to the quality of the original parts. It is uneconomical to use replacements of inferior quality. Contact parts should be of high-grade phosphor bronze to insure long life. Contact blocks should be of molded composition or of good-grade wood, properly seasoned and impregnated. Castings of malleable iron will insure long life and prevent breakage under the severe duty imposed in railway service. The impregnating gum should be free from impurities and should have good insulating qualities. Flexible multiple-conductor cable should be used, having a steel core in each conductor to give proper strength.



A safe and convenient way of connecting jumper leads to the head

If an old contact block is used, the fiber pins should be sheared off flush, and the dirt and carbon removed. It should then be shellacked. If the block shows evidence of burning it must be tested before the leads are soldered. Dirty contact holes should be drilled with the next larger size drill.

From 2¼ to 2¾ in. of outer insulation must be removed from the cable, depending upon its number of separate conductors, and about ¾ in. of insulation must be removed from each separate conductor. Care should be taken not to nick the strands of wire. Tin all cable ends and wrap the ends of the insulation with waxed thread.

The leads should be soldered with a blunt iron to quicken the process and prevent the contacts from burning the block. Soldering should be done carefully, so that the contact block or insulation will not be injured. Alcohol and resin or some neutral soldering paste flux should be used; never use acid. After soldering remove excess solder and flux. If particles of solder are on the block, it must be scraped and given a thin coat of shellac.

Practically every train line jumper has one electrical cross-connection. This does not require a mechanical cross. Most of the wires not electrically crossed must be mechanically crossed at one end or the other of the cable.

These mechanical crosses should be divided between the two jumper heads, thus reducing the number of crosses to be made in each head and reducing the complications. When a cable having a large number of separate conductors is used, it is advisable to cross all the necessary center wires at one end and to cross the outer wires at the other end. While making the center connections, the outer ring of wires may be tied back to the cable with twine or tape to prevent interference.

When assembling jumpers and receptacles, care should be taken to line up the contacts. They should be lined up with gages, the lugs in the jumper and the grooves in the receptacle being used as guides. After the contacts are lined up properly and the contact block is clamped, new holes for the fiber pins must be drilled, and new pins inserted. A hex shank screwdriver and a wrench can be used conveniently to fasten the grip castings together securely.

Before clamping the block in the castings, the wires should be arranged so that the gum will surround each individual wire. None of the wires should touch the metal casting. The cable should be taped where it passes between the casting grips to insure that it is clamped securely. The head should be tilted to allow the cavity to be filled with gum. Do not screw the pipe plug into place until the compound has cooled.

After the jumper or receptacle is completely assembled, the connections of all circuits should be checked. Finally, it is recommended that a momentary insulation test at 2,000 volts, a.c., 60 cycles, be made between the separate conductors and between each conductor and the casting to insure against shorts or grounds.

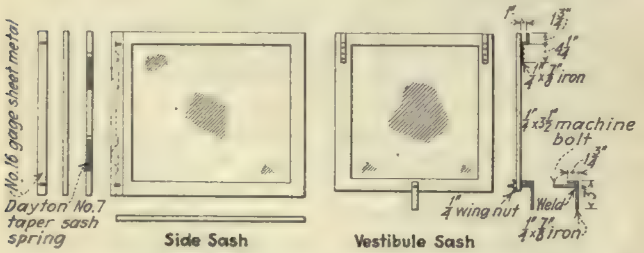
*Emergency Sash for Broken Car Windows**

By W. H. McAloney

Superintendent of Equipment
Georgia Power Company,
Atlanta, Ga.

EMERGENCY sash, one type for the front drop vestibule windows and one type for the side raised windows, have been developed by the Georgia Power Company, Atlanta, to replace broken window sash when cars are in service. The change from the broken window sash to the emergency sash can be made in very little time so that the car can complete the run without danger to the passengers.

The drop sash window is fixed with stationary brackets at the top and adjustable brackets at the bottom. By dropping the broken glass sash the stationary brackets of the emergency sash can be put in place at the top of the window sill outside of posts and the adjustable brackets can quickly be fastened on the bottom of the window sill with a wing nut. The side emergency sash has two sash springs fixed on one side, over which is placed a sheet metal housing fitting into the sash run. By raising the broken glass sash, the emergency sash can be pressed into place so that the pressure of the spring housing in the sash run will hold it. The broken window is then lowered to rest on the top of the emergency window.

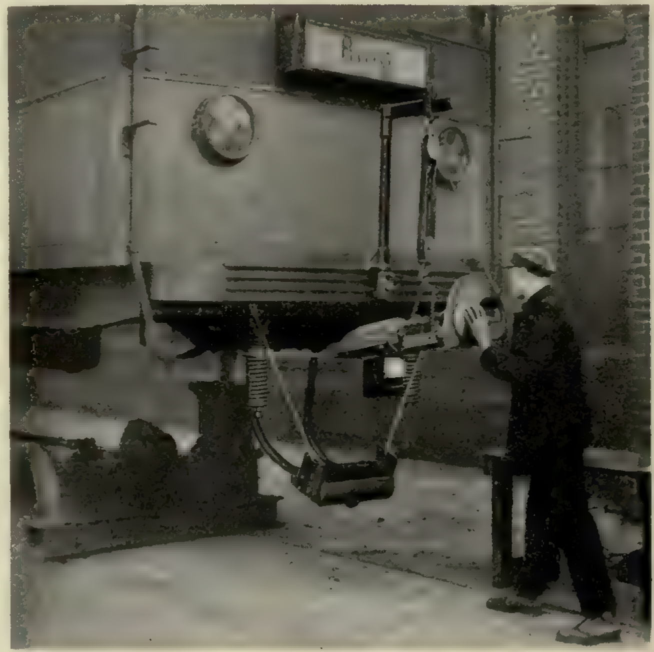


Broken window sash can be replaced by emergency sash to avoid danger to passengers when a car is in service

*Device for Removing and Installing Couplers**

By A. Hansmann

Master Mechanic
Hamburg Elevated Railway
Hamburg, Germany



This convenient device makes removal and installation of automatic couplers easy in Hamburg

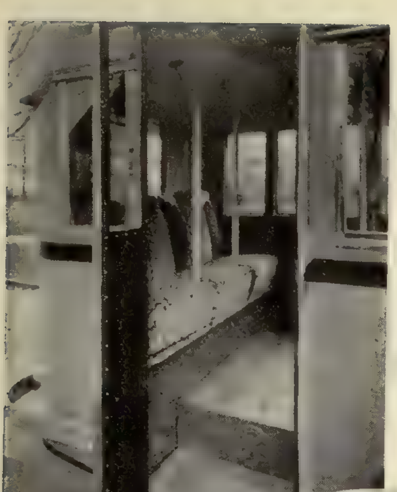
REMOVAL and attachment of the universal couplers used on the elevated cars of this company are facilitated by the device illustrated. Formerly it took four men to do this work, as the couplers weigh about 140 kg. (300 lb.), and, on account of the limited space, injuries were not infrequent. Now only one man is needed.

As shown in the illustration, the device consists of a small portable crane carrying a swiveling horizontal rail used as a runway to support a suspended pulley. This is attached to the car bumper in about three minutes by engaging the bottom of the vertical column with a pin in one of the 12-mm. (½-in.) holes in the bumper. It is held fast with a through bolt. For removal the coupler is held by the tackle and unfastened. Then it is dropped and rolled outward so that it can be placed on a table. Installation is made in the reverse order. Increased safety is assured by the method. The device cost 50 reichsmarks ($12) and weighs 22 kg. (48 lb.).

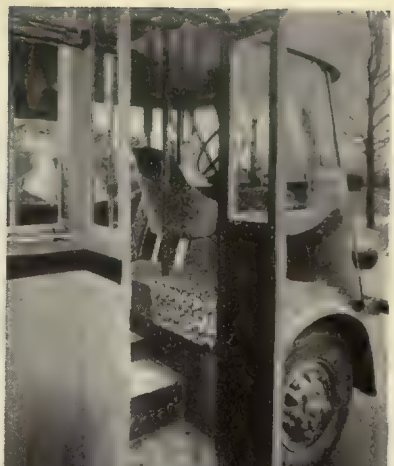
**Submitted in* Electric Railway Journal *Prize Contest.*

The Taxi-Coach

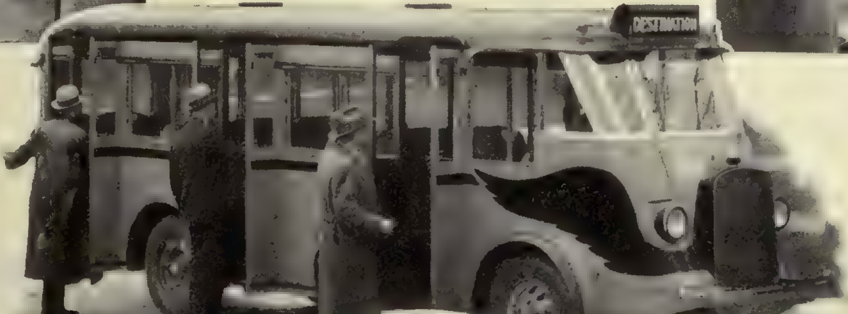
A New Development in the Bus Field



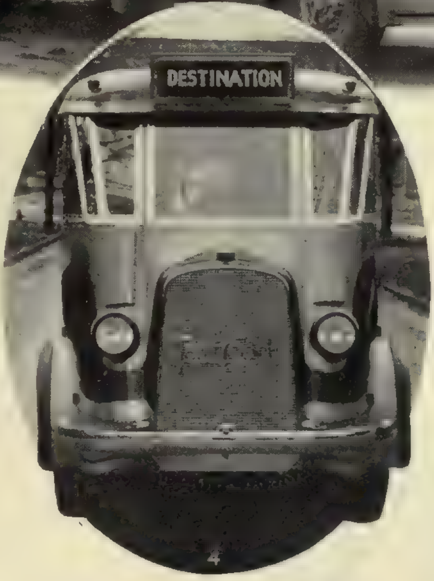
1—Rear compartment, showing the upholstered individual seats and stanchions with fare slots



2—Operator's seat is in the front compartment placed high above the front wheels. Fare receptacle is at the left of the operator



3—With three compartments and three doors, loading and unloading time should be much less than that of the single-door bus



4—Over-all width has been reduced to that of the conventional automobile for flexibility in traffic

SERVICE, comfort and flexibility approaching that of the private automobile were the goal in the design of the Taxi-Coach just announced by the Twin Coach Corporation, Kent, Ohio. These qualities, it is believed, will attract a large number of people who travel to the business section in private automobiles during the non-peak hours of the day.

The Taxi-Coach is offered as a semi-mass transportation vehicle to be operated with close headways. Having the same width as the conventional automobile it can be maneuvered through city traffic with equal flexibility and ease. Owing to its small capacity and high speed, the vehicle should also be found suitable for frequent service in outlying districts and as feeders to the main lines.

Unusual body style has been obtained by the division of the interior into three compartments, two of which seat six passengers and the third, five. Each compartment has an entrance and exit door at the right side, within 5 ft. of the left end seat. This arrangement is expected to reduce loading and unloading time. Crowding is eliminated, and a semblance of privacy is created by the compartments and the 22 in. wide individual seats.

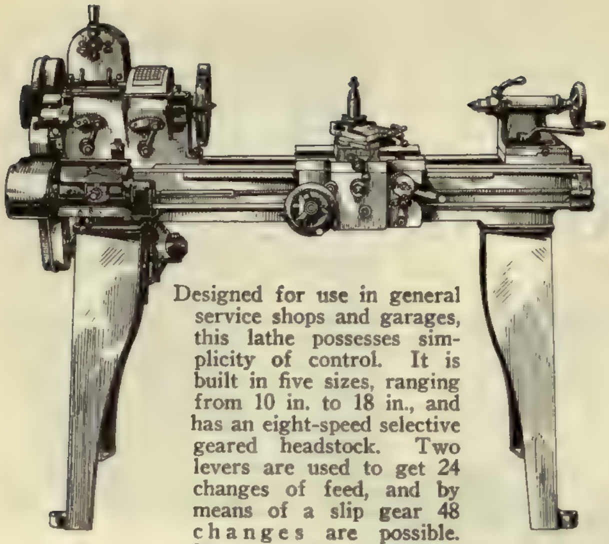
The division of the interior into separate cross-wise compartments raised the problem of fare collection. This problem has been met with an ingenious remote fare collecting system. Fares are deposited in a slot in the stanchion alongside of each seat. The passenger deposits the correct coin in the slot as he is seated, and it is then carried by an electro-pneumatic transfer system to individual glass receptacles in the front compartment where it is checked by the operator. Each glass receptacle represents a seat; those seats occupied by passengers should show a coin in the corresponding receptacle. Seats occupied are indicated by small electric lights beside the operator. The operator can transfer the coins, individually or collectively, from the receptacles to a Johnson fare box which counts, separates, then drops the coins into a change-making apparatus. Passengers can secure change from the operator by inserting their money in a separate transfer tube, which delivers it to the operator, and receiving the correct amount in return. Transfers, tickets and passes can also be exchanged in this manner.

An electric sign prominently located on the front end of the bus automatically displays the words "Standing Room Only" when all seats are occupied. This will inform awaiting passengers who may not wish to ride as standees, and thus avoid unnecessary stopping. The three compartments have a total standing room capacity of seventeen.

Over-all completed weight, including the 100-hp. engine, has been held to less than 7,500 lb. by the design of a new type of chassis and body structure, and the liberal use of duralumin.

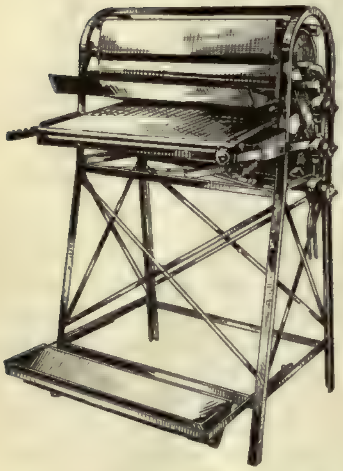
By attaining flexibility in traffic, maximum acceleration and deceleration with comfort to passengers, quick loading and unloading, it is believed that automobile performance is insured with this vehicle.

Pertinent Briefs

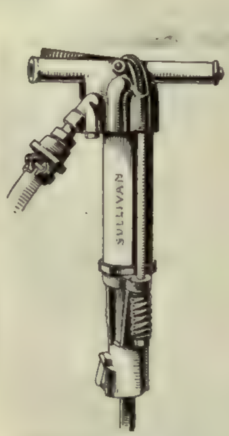


Designed for use in general service shops and garages, this lathe possesses simplicity of control. It is built in five sizes, ranging from 10 in. to 18 in., and has an eight-speed selective geared headstock. Two levers are used to get 24 changes of feed, and by means of a slip gear 48 changes are possible. Manufacturer: LeBlond Machine Tool Company, Cincinnati, Ohio.

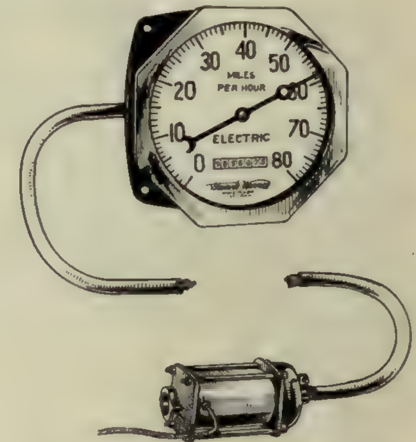
Mica undercutter is equipped with a portable motor, ¼ hp., mounted in a universal swivel yoke, and a flexible shaft, 5 in. long. The driving shaft is chucked in the collet, and has a universal joint to allow undercutting of railway motors without dismantling them. It is also equipped with an adjustable depth gage and two guide rollers with angular adjustment. Manufacturer: Keller Mechanical Engineering Corporation, Brooklyn, N. Y.



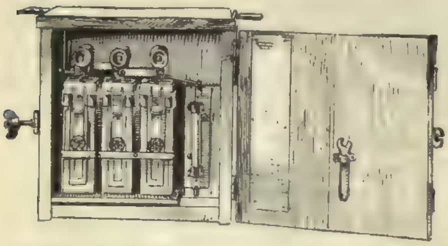
Sheet dryer for blueprints, negatives, blue line and brown line prints up to 24 in. wide is equipped with an electric heater for 110 or 220-volt circuits. With a chromium plated cylinder it can be adapted for drying photo prints. It is also furnished with gas heater. Manufacturer: C. F. Pease Company, Chicago, Ill.



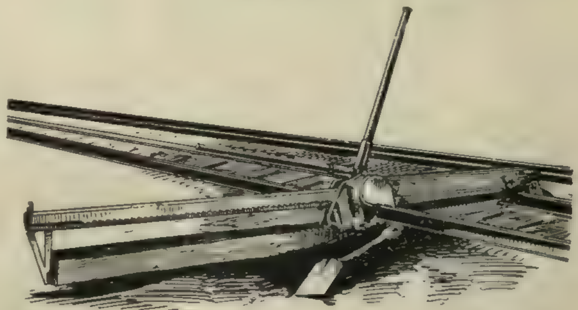
Pneumatic concrete breaker weighs 72 lb. It is said that it runs smoothly and with little vibration, thus reducing fatigue to the operator. It requires a ¾-in. air hose and connections. Any ordinary form of tool made from hexagon steel with plain hexagonal collar shank can be used with it. Manufacturer: Sullivan Machinery Company, New York.



No mechanical connections feature this electric speedometer which has only two elements, an indicator and a converter. The latter is assembled directly on the sleeve of the driven gear without reduction through an adapter, and is connected to the indicator by a six-wire cable. The indicator contains a motor operated by battery current. Manufacturer: Stewart-Warner, Chicago, Ill.



Aluminum lightning arrester can be used on cars and in generating plants and substations, indoors or outdoors. With this type there is no need for pole arresters. Arrester is made up of groups of aluminum cells in series, filled with a fluid and supported from porcelain covers to prevent vibration and short circuits. Manufacturer: General Electric Company.

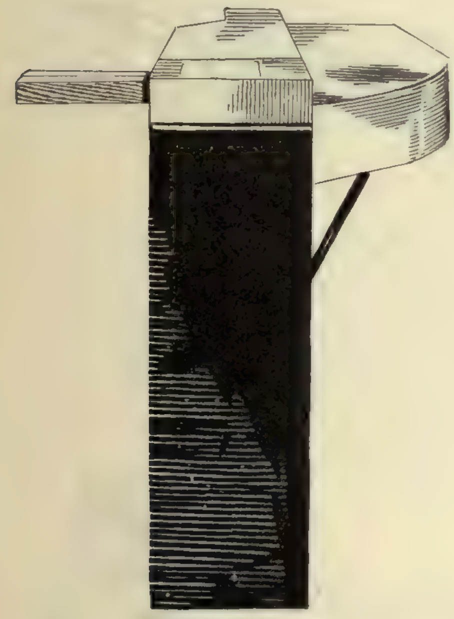


Tie renewal machine removes old ties from the track without need of digging, and inserts new ties without disturbing ballast. The old tie is pushed out as the new tie goes into place. This work can be done in twelve minutes with a crew of three men. Manufacturer: Nicholas R. West, Hobart Building, San Francisco, Cal.

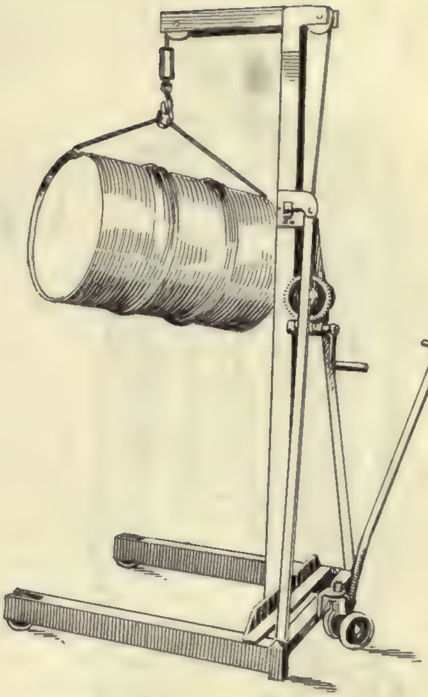
in New Equipment

Tree wire has protection against wear from rubbing against tree limbs. The protection is obtained by an armor of brakelining wrapped around the rubber compound insulation. This wire is marketed under the trade name of Okolast. Manufacturer: Okonite Cable Company, Passaic, N. J.

"Coinstile" is entirely mechanical; no electrical connections are necessary. Installation is made by simply bolting down level. Patented cam mechanism makes opening, locking, ejection of coins, registration and silencing positive. Rotary movement of arm is retarded in last 10 deg. of turn. Passage space is 19 in. wide. Manufacturer: American Turnstile & Supply Company, 140 Liberty Street, New York, N. Y.

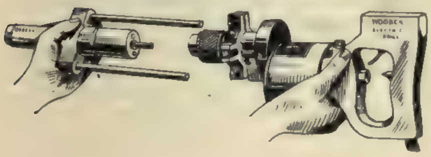


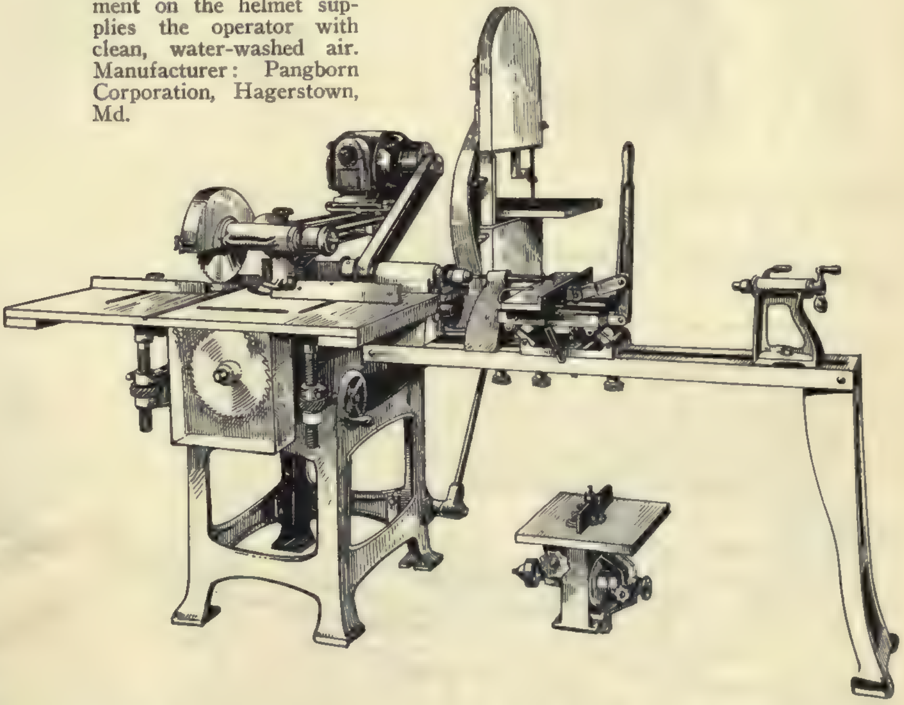
Sand blast helmet of rubber is fitted with a curved windor which gives operator clear vision. Window is protected against breakage by a wire screen. Both glass and screen are replaceable. An attachment on the helmet supplies the operator with clean, water-washed air. Manufacturer: Pangborn Corporation, Hagerstown, Md.



Portable crane for general utility service can be obtained in heights varying from 6 to 14 ft., and capacities from 500 to 2,000 lb. Four types of frames are available: Telescopic, hinged, revolving telescopic and revolving hinged. Hand worm, hand spur or electric worm drive are offered as standard. Manufacturer: Lewis-Shepard Company, Watertown, Mass.

Electric dual twist and hammer drill can bore with equal facility into wood, metal and masonry. It can also be used for grinding, scratching or buffing. The tool is furnished in a case with star and twist drills. Manufacturer: Wodack Electric Tool Corporation, Chicago, Ill.

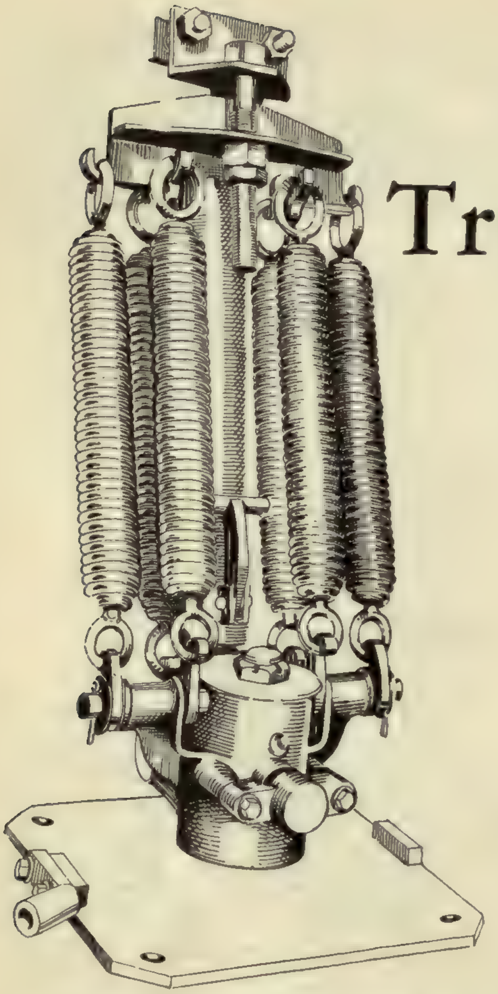




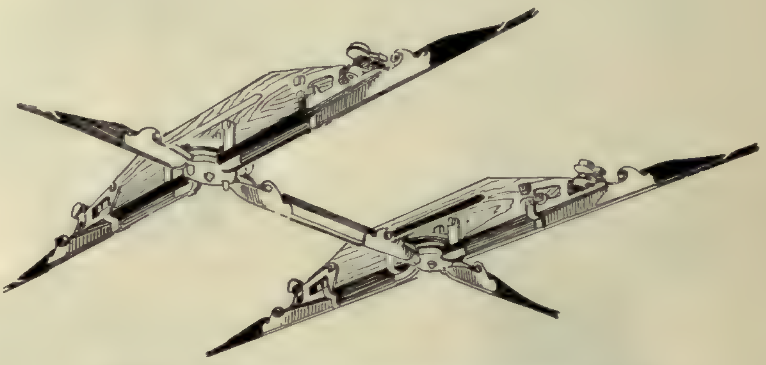
A complete shop is offered in one machine, which combines all the necessary woodworking units, each being individually driven by the same motor. The standard equipment supplied consists of saws, rip saw unit, saw table, swing arm, cross-cut head, jointer, band saw, lathe, shaper, mortiser and boring attachment. Manufacturer: Porter-Cable-Hutchinson Corporation, Syracuse, N. Y.

New Products for
Trolley Bus Operation

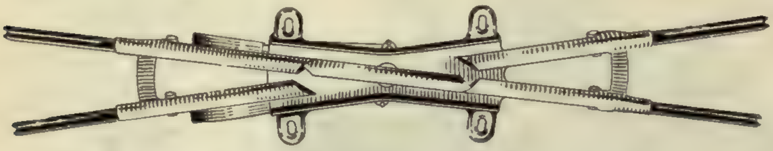
Developed by the Ohio Brass Company



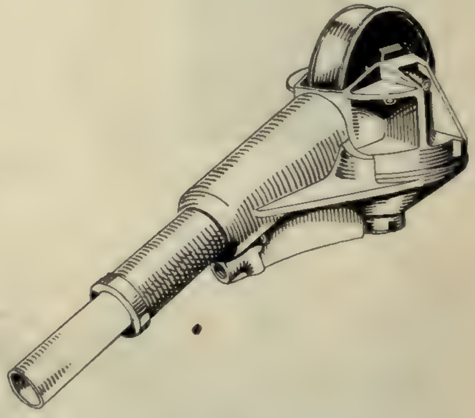
Welded all-steel construction makes this six-spring trolley base for trolley buses 33⅓ per cent lighter than previous models, without sacrifice of strength. A rubber block instead of buffer springs provides an adequate buffing protection, and a main bearing of Timken adjustable roller bearings allows maximum freedom in lateral movement



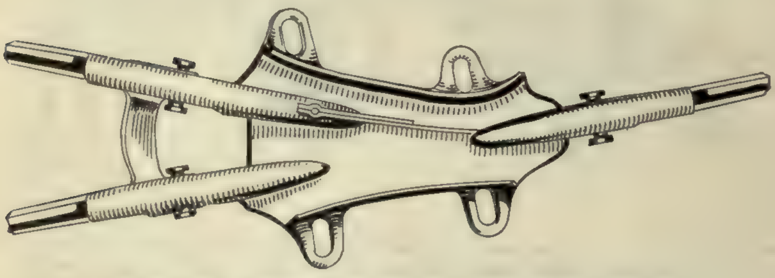
Insulated adjustable crossovers for trolley bus overhead have a higher and longer wood beam than standard, which, with the air gap, provides the additional insulation necessary at crossings of positive and negative wires. These crossovers are adjustable to any angle from 45 to 90 deg., and are designed for one wire over one wire, one wire over two wires, two wires over one wire (as illustrated), or two wires over two wires



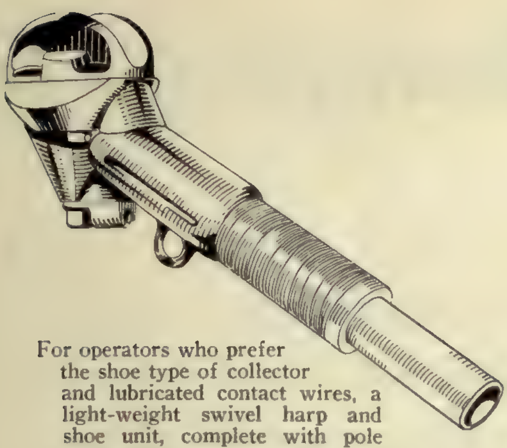
An acute angle crossover requires a long pan, but this does not allow the wheel of a trolley bus swivel harp to operate correctly unless a guide runner is placed in the pan. The guide of the illustrated crossover is operated by a trigger mechanism, which places the guide runner in the correct position when the trolley wheel moves under one of the trippers



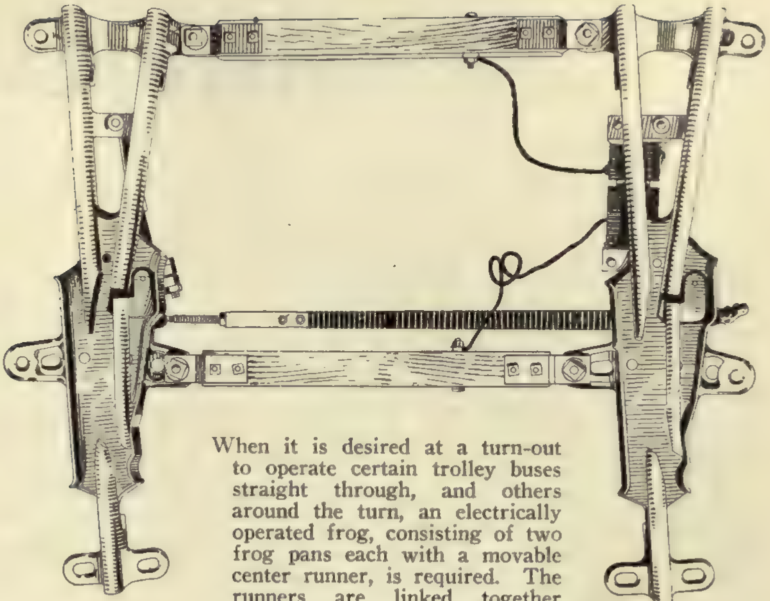
With the swivel casting supported on the pole head by a 4½-in. ball bearing a free rotating action is provided in the improved swivel harp and wheel unit. Current from the wheel is shunted around the bearing. Insulation from the pole is accomplished by a rubber sleeve, which also serves to silence wheel noise. The 4-in. bronze wheel has a special groove. Harp castings are of aluminum



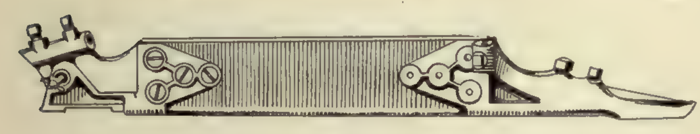
Spring frog, designed for use at points where positive operation is desired, such as wyes, loops and passing sidings. The spring may be furnished for straight line or turn-out as needed



For operators who prefer the shoe type of collector and lubricated contact wires, a light-weight swivel harp and shoe unit, complete with pole end and insulation, has been developed. Construction features are a ball and socket bearing between the shoe and harp; close assembly of swivel joint and shoe, permitting backing; convenient mounting of shoe, allowing quick replacement; copper bearing washer of ample capacity, carrying current through the ball and socket without pitting; heavy rubber insulation, and streamline design, eliminating overhead fouling

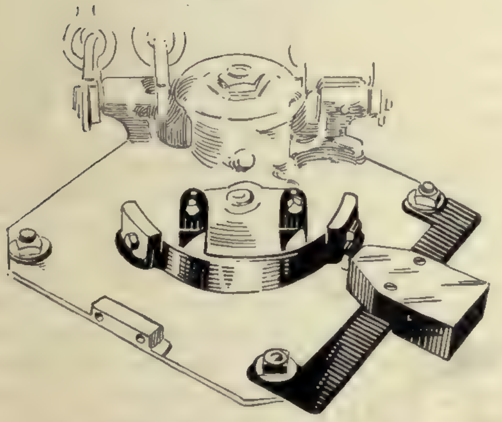


When it is desired at a turn-out to operate certain trolley buses straight through, and others around the turn, an electrically operated frog, consisting of two frog pans each with a movable center runner, is required. The runners are linked together mechanically and are actuated by two solenoids. The runner position in the frog is set, as for an electrically operated track switch, by the controller

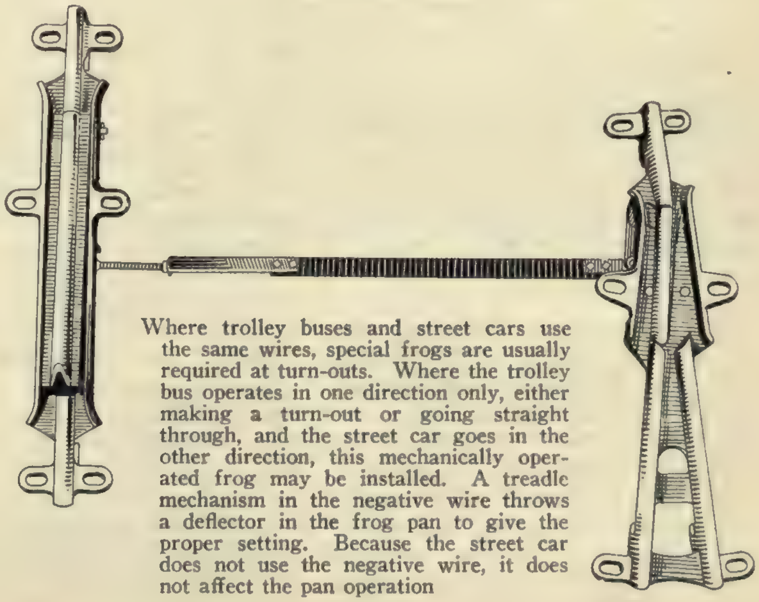


Light weight and interchangeability are features of this insulated approach. It is particularly suitable where crossovers and turn-outs have previously required special insulated pieces. One end is equipped with a casting which fits into the wire groove of a frog or crossover in place of the cam tip. Provision is made for locking it into the wire groove and also for dead-ending trolley wire when approach is used with a crossover or frog. Trolley bus overhead requires this approach in conjunction with live rigid crossovers at crossings where the angle is less than 45 deg. and where insulation is necessary

This trolley pole, designed for trolley buses, is made of heat-treated seamless steel tube with an opening at the harp end for passing the cable from the harp to the inside of the pole. A second opening near the base provides for leading the cable out for connection with the terminal block on the roof. The harp end is designed to fit over the shank of the two harp units, described elsewhere on these pages.



The new touring range indicator is a constant guide to the driver, for it warns him by flashing a light when he reaches his maximum safe touring range, usually 12 ft. from the center line. The device consists of a segment, with adjustable castings at the ends, which is mounted on the turret of the trolley base. As the turret swings it engages the plunger of a switch which lights the signal.



Where trolley buses and street cars use the same wires, special frogs are usually required at turn-outs. Where the trolley bus operates in one direction only, either making a turn-out or going straight through, and the street car goes in the other direction, this mechanically operated frog may be installed. A treadle mechanism in the negative wire throws a deflector in the frog pan to give the proper setting. Because the street car does not use the negative wire, it does not affect the pan operation

More Comments on the

The thoughts advanced in your business platform are good sense. You appreciate, as well as I, that one cannot change humanity and its business practices at a stroke, but if enough people read your statement of principles, I believe that it will lend impetus to some careful thinking.

There is no doubt in my mind but that this country will emerge from the present crisis in a satisfactory fashion, largely due to the resourcefulness of our people, but I further think that the recovery will be expedited if we have greater leadership than has been evidenced up to the present time.

Samuel Kahn,
President,
Market Street Railway,
San Francisco, Cal.

▼

I have read your platform for American business, general objectives, conclusions and check sheet of suggestions and I am gratified to say that the whole program meets with my heartiest approval and support. The presentation of this "statement of principles" for American business in 22 of your publications will undoubtedly have a very wholesome and favorable reaction.

G. D. Crabbs,
President,
Philip Carey Company,
Cincinnati, Ohio

▼

I have read with a great deal of interest your statement of principles for American business; and while I believe the statement is somewhat Utopian, I feel that such belief on my part detracts in no way from the statement and manner in which it should be received by American business.

I, to some extent, question paragraph No. 1 on page No. 3 under the caption "Maintenance of Established Standards of Living" where you state in effect: "The belief that there is danger of a general overproduction of wealth, that technical development necessarily involves unemployment, . . . is an economic fallacy." While I believe this doesn't necessarily produce *protracted* unemployment, the mechanization of industry cannot avoid temporary unemployment, which condition will exist until the slack has been taken up through the creation of new avenues of endeavor, or the shifting of such unemployment to other lines of industry permitting such absorption. I believe this fact must be recognized, and if in business, as has been suggested in your statement, more instruments be set up, the evils of unemployment will be minimized.

Another matter, which to my mind has caused considerable concern, is the habit of our various industries to distribute large dividends in fat years. It occurs to me that a reasonable amount could be set aside out of earnings to a dividend reserve, and the balance of earnings to go into surplus. I believe this would have a tendency to stabilize market quotations and reduce speculation mania in prosperous times. While the stockholders have the right to expect the major portion of earnings, I am of the impression that if, after paying a reasonable dividend, an additional amount is put aside for the purpose of maintaining such reasonable dividends in periods of depression, there will be a greater feeling of security and a more steady market because of the fact that the investor is more assured of a continuous return through both good and bad times. I believe this would have a tendency to eliminate wide fluctuations in market quotations and stabilize stock equity investments. The lure of large returns in prosperous times invites abnormal speculation, which, in my belief, is injurious to business generally, as evidenced by the recent stock market collapse, which in its incipiency was claimed to be a stock market panic only, without effect upon business generally. The fallacy of this thought has, unfortunately, been strongly demonstrated. Earnings going into surplus are generally looked upon for use of any corporate purpose, whereas the dividend reserve would readily be interpreted as a stablization of return.

Another matter which I believe should be given serious consideration is the large number of business failures, most of which, I dare say, have been caused by the lack of knowledge of true business principles. The small concern, principally, conducts business without a true idea of costs, and the banks are led to lend money on statements which often are not reliable because of the lack of proper reserves and a true knowledge of cost accounting. It is my belief that if some agency could be set up, probably by the banks, thereby accountants could be available for the preparation of statements to be given the banks as a basis for credit, unwise loans could be avoided, and concerns that would otherwise be doing business to an ultimate failure, could be persuaded to retire before disaster overtook them.

We have agencies in different cities which make it possible for industrial enterprises to receive the benefit of such studies, but as a rule the cost incident to such examination and audit is prohibitive, and, therefore, not availed of. If the government *will* persist in adopting a paternal attitude toward industry, it seems to me this is one avenue along which it could exert its influence and help. On the other hand, if it is a matter for the banks throughout the country, I believe a contributory plan could be devised by means of which the cost could be shared, and the banks ultimately save money through the elimination of bad loans.

John L. Swope,
Vice-President,
United Railways & Electric Company
of Baltimore

▼

I have read through the statement of "Principles for American Business." My initial reaction is that they set up excellent ideals. However, reduced to practicalities, I am inclined to think that the greatest hinderance to accomplishment lies in the difficulty of bringing about a standardization of ideas as to what might be termed "business morality." In other words, until the millenium, we will have with us the individual

BUSINESS PLATFORM

Operating and manufacturing executives of the electric railway industry praise the principles that were outlined in the proposed platform for American business

who is willing to take advantage of those who hew to the line of such ideals as you have set forth. Regardless of all that, whatever of good may be accomplished in such a movement should be striven for.

Another factor of interference which is economic in its operation is that "prosperity," as such, possibly cannot be a continuing process. I am inclined to view it as only the rise to the crests of waves in the ordinary course of business cycles. Corrective down swings are bound to occur. Just to what extent we can regulate the violence of fluctuations and, what is more important, the social effect thereof, is impossible of determination. There are probably involved some problems of sociology and social readjustment as well as those of business management.

W. S. FINLAY, JR.,
President,
West Penn Railways

▼

I read with greatest interest the proposed business platform and wish to compliment you on the clear, concise, correct manner in which this has been assembled and in which it has been presented to your readers. It seems to me that you have covered the field very thoroughly and as I am wholly in accord with the principles which you have stated I have no suggestions or criticisms to offer.

C. H. KING,
President,
Ohio Brass Company

▼

I have looked over the statement of principles and feel very much in accord with them. The problem, of course, is to have them put into effect, and I have no doubt that presentation in your numerous publications will be mighty helpful.

W. H. WOODIN,
President,
American Car & Foundry Company

▼

I think the plan sets out admirably the general objectives for sound business development. I am impressed with the thought that the plan requires for its success a greater degree of co-operation between industries than is now permissible under federal laws. I suggest as one of the objectives such modification of the Sherman Act and the Clayton Act as will permit the kind of co-operation which has been so well set out in this memorandum. I am inclined to the opinion that our present situation is due, in part, at least, to the fact that our political policies do not square with our economic interests.

P. H. GADSDEN,
Vice-President,
United Gas Improvement Company

▼

The statement of principles for American business is quite impressive and seems to me logically a basis in the betterment of sound business.

There is one item that caused me to hesitate as I read over the printed plan. Under No. 1, Maintenance of Established Standards of Living, the last line of the recommendation reads: " . . . thereby raise the standard of living of the American people." In view of the fact that it is realized today that the standards of living are no longer considered the bare necessities of food, clothing and shelter—that our standard of living today is on a much higher level than was ever before attained by any people of the earth—I wonder whether the recommended ending here should not read: "Thereby maintain the present standard of living of the American people."

These are times in which courage and sound business thoughts must dominate and your program seems quite timely and appropriate to the cause.

W. H. CORDES,
Advertising Manager,
American Steel & Wire Company

▼

I have read with interest your platform for American business because I have been giving considerable thought to this subject. In principle I agree with the idea that industry must do a better job of co-operation, co-ordination, and planning. Carrying on propaganda along this line is bound to stimulate the thinking of business executives all over the country. My one criticism of the platform is that in its very nature it deals with generalities. It seems to me that one of the real weaknesses of most associations, chambers of commerce and other bodies, is their ability to pass generalized resolutions without offering any detailed or specific plan of transforming generality into a reality.

LEWIS H. BROWN,
President,
Johns-Manville Corporation

▼

Undoubtedly this presentation of your "Platform for American Business," which I consider most effective, will greatly help in stimulating the interest of the business man in your valuable contribution to the business thought of the time.

T. FITZGERALD,
Vice-President and General Manager,
Pittsburgh Railways

NEWS *of the Industry*

Improvement Projects

Sacramento, Cal.—Keeping its year-old promise to the city, the Sacramento Northern Railway will start its five-year street paving program here at once. The five-year program, to cost $250,000, comprises paving or repaving sections of the thoroughfares as agreed on the road's franchises, between the tracks and for a space on the outsides.

✦

San Francisco, Cal. — Grant of the supplementary permit asked by the Market Street Railway for the proposed extension of the Turk Street line out Turk from Divisadero to Arguello and thence out Balboa to 30th Avenue, has been recommended by City Engineer O'Shaughnessy.

✦

Chicago, Ill.—Extension of station platforms, and other improvements now being made over the Chicago Rapid Transit system, are progressing satisfactorily. Steelwork has been installed at fifteen stations where platforms are being lengthened.

✦

Montreal, Que. — Another move has been made in connection with the proposal for a subway system for Montreal. The idea is to submit the plan to citizens to find out the public's attitude toward the new project. The estimated cost for subway lines such as proposed would be between $65,000,000 and $67,000,000, and it would be necessary for the city to guarantee the bonds to be floated by the Montreal Tramway to finance the project.

✦

New York, N. Y.—First bids for construction of the Sixth Avenue subway are being advertised by the Board of Transportation. The bids are for the section extending from 53rd Street to 43rd Street. They will be opened May 19. The new subway is to be constructed in four sections. Bids for the second section, from 43rd to 33rd Streets, are expected to be advertised before the end of May, and the remaining two sections some time during the summer.

Fare Changes

Pasadena, Cal.—The Railroad Commission has extended until May 15, 1931, the time limit under which Pacific Electric Railway is to carry out changes in its bus service and passenger fares here under terms of a recent order of the commission making extensive changes and revisions therein. The city requested that no changes be made in the service and fares until the new equipment, provided for in the commission's previous order, is available for service. The company has agreed to that request.

(Continued on Page 272)

Public Relations a Major Maryland Topic

More than ordinary interest attached to the meeting of the Maryland Utilities Association held at the Lord Baltimore Hotel, Baltimore, on April 10. Some 300 delegates attended the sessions, which lasted all day, with a dinner dance in the evening. After the entire association was called to order and welcomed by President R. E. Town, of the Potomac Edison Company, the "electric eye," or photo-electric tube relay, was demonstrated by R. H. Maxwell of the Westinghouse Company. Separate sessions of the transportation, electric and gas groups were then held for the rest of the morning, after which the entire body assembled for luncheon. At the afternoon session William Knowles Cooper spoke on tendencies at home and abroad; Frank R. Phillips, on the progress, development and future prospects of utilities; and Lloyd C. Thomas, on the romance of radio.

At the meeting of the transportation group, which was presided over by Adrian Hughes, Jr., Halbert O. Crews, supervisor of public relations Chicago Surface Lines, emphasized the necessity of meeting the public face to face. He outlined the organization of a speakers' bureau for the purpose of informing the public on utility subjects. The speakers are men picked from the employees because of their ability. They are trained especially for the work, and know their subjects thoroughly before going out. Nearly 300 calls a year are received by the Chicago Surface Lines alone for speakers. In connection with the addresses, stereopticon pictures, movies and talking pictures are all used to good effect. The work of these men has resulted in a wonderful change in public sentiment. Good management and good service, Mr. Crews holds, are fundamentals that can be told about to good effect by the speakers.

Charles Gordon, managing director American Electric Railway Association,

(Continued on Page 273)

The Business Outlook

BUSINESS has been backsliding since the slight spring stimulus spent its force the latter part of March. Security markets have closely followed suit and commodity prices continue their relentless movement toward inconceivably low levels. Seasonal building improvement seems to be weakening again, and carloadings still show little more than seasonal recovery. Hope of reversal of the downward drift of steel production persists, and marked increase in automotive requirements becomes doubtful. As first quarter business bumps on the bottom, there appears no immediate and definite beginning of recovery. Governor Norman's mission has apparently meant nothing more than further futile effort to force short-term money rates lower in hope of melting frozen long-term investment funds. Our idle gold hoard piles up without increasing the means of payment by credit expansion because of paralysis of banking policy, thus prolonging price deflation, impoverishing ourselves as well as the world and making poor old Midas appear a piker by comparison.

—*The Business Week.*

James Dalrymple on World Tour

James Dalrymple, formerly manager of the Glasgow Corporations Tramway, recently reached Vancouver, B. C., where he is making a short stop-over during a tour of the world. An authority on local transportation with a reputation that is world-wide, Mr. Dalrymple was constrained to comment on the local situation complicated by the appearance of the threat of competition from buses run independently.

He states that while conditions in English cities differ from those in Canada, he believes that as cities increase in density in population, street cars become still more economical as a means of transportation. In Glasgow competition between bus and street car services was intense, but the street car more than maintained its place. Today in that Scottish city, by a graded ticket price system, a passenger can travel 20 miles for 4 cents, the maximum fare, 1 mile for 2 cents, and half a mile for 1 cent. He stressed the fact that through intensive maintenance and improved track companies in the United Kingdom were endeavoring to reduce noise as much as possible.

Mr. Dalrymple recently made an investigation and a report for the city on the tram system in Buenos Aires.

Governor Signs New York Unification Bill

Governor Roosevelt of New York on April 23 signed the Downing-Steingut transit unification bill which will permit the Transit Commission to adopt formally a plan for the unification of rapid transit facilities in New York City. The measure incorporates the major features of the Untermyer transit unification plan. It authorizes the creation of a Board of Transit Control of nineteen members, ten to thirteen of whom may be appointed by the Mayor. The 5-cent fare is assured in the present bill by the exemption from taxation of the securities to be issued by the proposed Board of Transit Control.

Carrying the Message to the Consumer

Exterior view of the Public Service advertising bus, "Miss South Jersey." The new bus, a unit of Public Service Co-ordinated Transport, Newark, N. J., will be used to advertise the various seashore and other long-distance bus routes and to distribute advertising matter and time-tables. The new bus is artistically painted and the interior comfortably equipped with lounge seats, with chairs and with a radio. Its mission will be state-wide.

Franchise Proposal Withdrawn at Calumet

Calumet Railways, Inc., has withdrawn from the cities of Hammond, East Chicago and Whiting, Ind., the service-at-cost franchise offer presented a year ago. The Council of Hammond had twice rejected the plan. Inasmuch as the franchise stipulated that it must be accepted in identical form by the three communities concerned, railway officials felt that nothing was to be gained by leaving the matter open. The company proposed to spend between $2,000,000 and $3,000,000 in rehabilitating the railway system of the three cities.

Late in 1929 a syndicate of business men of the Calumet district backed by the Midland United Company, as minority stockholder, bought the Hammond, Whiting & East Chicago Railway at foreclosure. Subsequently the Calumet Railways, Inc., was chartered as the successor company. A service-at-cost franchise was presented to the boards of works of the three cities on March 12, 1930. In Hammond and Whiting the franchise was received favorably, but the East Chicago board of works never acted upon the proposal. Twice the Hammond Council voted against the franchise. The Whiting Council never acted upon it.

Hammond, Whiting and East Chicago form an important part of the well-known Calumet region of Indiana. Local transportation is for the most part provided at present by the Shore Line Motor Coach Company, a subsidiary of the Midland United Company. Had the franchise been approved, the Calumet Railways would have taken over the Shore Line buses, rehabilitated the railway and co-ordinated rail and coach services.

◆

Many Subjects Before Summer Meeting of Pacific Claims Men

The executive committee of the Pacific Claims Agents' Association met in the offices of W. H. Moore, claim agent of the San Diego Electric Railway, Union Building, San Diego, Cal., recently, and it was decided to hold the next annual convention of the association at Stockton, Cal., Aug. 6, 7 and 8. At the Stockton convention papers on the following subjects will be read:

"Unique Methods of Locating Witnesses to Accidents," by Harry Woodrow, assistant claim agent Key System, Inc., Oakland, Cal.; Marshall Widenor, assistant claim agent San Diego Electric Railway; J. N. Shrader, chief investigator Los Angeles Railway, and M. R. Poundstone, Pacific Electric Railway, Los Angeles.

"Some Lessons I Have Learned from Dealing with Claimants," by O. S. Krogstad, chief claim adjuster Pacific Northwest Public Service Company, Portland, Ore.

"Some Methods That Have Proved Successful in Securing the Co-operation of Attorneys in Adjusting Instead of Litigating Claims," by J. H. Handlon, claim agent Market Street Railway, San Francisco.

"What Can We Do to Improve the Personnel of Our Juries," by Melvin C. Chapman, Jr., claims attorney Key System, Inc., Oakland, Cal.

"The Relationship of the Claim Agent with the Community and the Local Bar Association," by Thomas G. Aston, claim agent Spokane United Railways, Spokane, Wash.

"What Should Be Done with Claims for Alleged Personal Injury Arising from Very Minor Automobile Accidents," by A. E. Nicoletti, claim agent Key System, Inc., Oakland, Cal.

"Is It Good Policy to Try to Collect for Damaged Equipment and Other Property?" by H. D. Turner, chief clerk Pacific Electric Railway, Los Angeles, Cal.

"What Has Been Done to Enforce the Ethics of the State Bar Association in California Relative to Ambulance Chasing," by B. C. Sterry, general attorney Los Angeles Railway.

"Trend of Recent Decisions in Personal Injury Cases," by A. L. Levinsky, attorney Stockton Electric Railway, Stockton, Cal.

"What's New in Claims Work"—Discussion to be led by C. M. McRoberts, general claim agent Los Angeles Railway, Los Angeles, Cal.

◆

Essential Service Says Commission About Railways

In its report to Governor Caulfield covering the years 1929 and 1930, the Missouri Public Service Commission, in commenting on street railway conditions in the state, said that the industry is the victim of the evolution in transportation. It continued:

> Nevertheless, it is rendering an essential service and must be maintained. On its own initiative the commission authorized new fare schedules in St. Louis and Kansas City designed to yield additional revenue without increasing the rate of fare to the regular rider. The commission feels that the new schedules have been successful in operation and have been favorably received by the riding public.

The commission points out that the new schedules applied to Missouri street railways for the first time the principle underlying water, gas, steam and electric rates that the unit charge should decrease with increased use of the service.

Railway Helps Community Chest Drive

COMMUNITY CHEST SPECIAL
COMMUNITY CHEST FUND
COMMUNITY CHEST -AGENCY SPECIAL
GIVE ONLY ONCE for 18 AGENCIES

Salt Lake City's annual Community Chest drive took place during the period from March 3 to 10 inclusive. It was effectively advertised and supported through the co-operation of the Utah Light & Traction Company. Among other things the company donated a street car for advertising purposes, and then contributed all cash received on this car during the six days it operated (from March 2 to 7 inclusive). Tickets, tokens and transfers were accepted in the regular manner, but it was made plain to riders that whatever cash was paid as fare would be considered as being contributed to the chest.

The car was run from 9 a.m. to 4:30 p.m. on a different line each day, on regular schedules, the routes being chosen from those most liberally patronized.

In addition to the display material on the outside of the car, signs were prominently displayed inside showing the various member agencies of the chest and pointing out what had been accomplished by the chest during the past year in furnishing relief to the needy.

The car proved to be a very valuable medium of publicity for the chest.

Fare Changes

(*Continued from Page* 270)

Yonkers, N. Y.—This city lost on April 16 in its attempt to prohibit the Public Service Commission from hearing the application of the Yonkers Railroad for an increase in fare rates.

✦

Gary, Ind.—The Gary Railways reports that many regular Gary Railways patrons are availing themselves of low rates of fare provided by the weekly pass and the token under the new fare structure placed in effect on March 29. The fare structure includes a weekly pass selling for 40 cents which entitles the bearer to an unlimited number of rides during the week at 5 cents per ride. A token rate of six for 50 cents is also in effect. The straight cash fare is 10 cents. The 10-cent zone limit was extended in some instances under the commission order. Intermediate fare zones between Gary and Hammond and Gary and Indiana Harbor were abolished. A cash fare of 20 cents between Gary and Hammond became effective under the new zoning system.

✦

Louisville, Ky.—No appeal will be made of the Federal Court's decision in the Louisville Railway case, Mayor William B. Harrison has announced. He said he believed an appeal would be useless and involve needless expense. A statement made by him was concluded as follows: "The court's findings of the facts and its application of the law are sustained by the findings in many similar cases upheld by the United States Supreme Court. The city's position will be to await a return to normal business and if the railway patronage shows a sufficient revival, to enter its claim for reduced fares at the proper time."

✦

St. Louis, Mo.—The People's Motor Bus Company announced that on Sunday, April 26, it would adopt the 25-cent Sunday pass plan that has been used by the St. Louis Public Service Company for several years. The pass will entitle the holder to an unlimited number of rides on the company's bus lines in St. Louis and St. Louis county on the date of purchase.

Bus Operations

Atlanta, Ga.—Pointing out that legislation enacted at the recent extraordinary session of the Georgia General Assembly affects both private and common motor carriers, James A. Perry, chairman of the Georgia Public Service Commission, has issued a statement emphasizing some of the more important features of the regulatory and tax measures. No owner or operator of a motor vehicle can be considered to have a vested right to use public roads of Georgia, and no perpetual franchise to use such public roads can be granted, the chairman declared.

✦

Trenton, N. J.—The single-track trolley line connecting Trenton and Camden will be replaced by fifteen buses of Public Service Co-ordinated Transport on permission of New Jersey Public Utilities Commission.

A.E.R.A. Members

Ever watch your mother bake a cake? She puts a lot of things into it, her best thought and work—result A GOOD CAKE.

That's compensation.

Have you filed your application for Exhibit Space at the

Atlantic City
Golden Jubilee Convention?

If not, don't delay. Put your product on display, give your exhibit your best thought and work—result MORE BUSINESS

That's compensation.

APRIL 30

closing day for the receipt of space requests. You are cordially invited. Get some Atlantic City sun in your system for next winter's big business.

THE EXHIBIT COMMITTEE

Tulsa, Okla.—Another step was taken in the litigation to prevent operation of jitney service here when District Court Judge Clendinning granted a temporary injunction to the United Service Company to restrain operation of the jitney lines. Judge Kennamer in the federal court recently issued an injunction against the jitney service on application of the Union Transportation Company and the Oklahoma Union Railway.

✦

Evansville, Ind. — The Evansville, Suburban & Newburgh Railway has been authorized by the Public Service Commission to carry freight, as well as passengers, on its proposed bus line between Boonville and Washington, to operate over state roads Nos. 61 and 57 via Lynnville, Winslow and Petersburg. Three round trips will be made daily, with connections at Boonville for Evansville.

✦

Jersey City, N. J. — Public Service Co-ordinated Transport proposed to substitute buses for trolleys in Hudson County. The four lines upon which the company would carry out the substitutes here, with the retention of some trolley service, are: Greenville, Journal Square, Montgomery and Jackson routes. Permission of the city has been obtained, but approval of the Public Utilities Commission must be obtained before the change can become effective. Independent operators oppose the change. The case has been set for hearing on May 14 and 15.

✦

Vancouver, B. C.—The City Council has appointed a committee to ascertain streets that could be used for the bus service contemplated by a Liverpool, England, syndicate. Under the present agreement between the city and the British Columbia Electric Railway the city cannot grant another franchise, but it can issue licenses for motor coaches. C. F. Rymer, representing the English syndicate, wants assurance of operation for five years at least, with fares on a zone system basis.

✦

Amsterdam, N. Y.—Petitions for rehearings in proceedings involving the authorization for the operation of bus routes in Amsterdam were denied by the Public Service Commission on March 27. The commission recently authorized Charles Vollmer to operate additional bus routes here and removed restrictions in certificates for other bus routes so as to permit the Vollmer buses to pick up passengers along the route of the trolleys operated by the Fonda, Johnstown & Gloversville Railroad. The commission held that the railroad's petitions for rehearings in the proceedings authorizing the Vollmer bus routes were not well taken.

✦

Los Angeles, Cal.—The Pacific Electric Railway has been authorized by the Railroad Commission to reroute its motor coach line No. 1 in Glendale from the intersection of Broadway and Glendale Avenue for the purpose of serving a well-built-up district along Lexington Drive, not now served, and to provide a more frequent service along Verdugo Road between Broadway and Chevy Chase Drive.

✦

Buffalo, N. Y.—Finis is being written to the Buffalo & Williamsville Railway, superseded by buses last September. Recently the first of the remaining cars was run out at the rear of the carhouse on the bank of Ellicott Creek and burned. Tracks from the carhouse to Main Street will be removed at once. Plans for taking up the rails in and along the side of Main Street have not yet been completed. The overhead has already been taken down and scrapped. Only old car number 23 has been spared. It stands in the yard at the rear of a home in Williamsville, where it is used as a playhouse for children.

Service Changes

Oakland, Cal.—The East Bay Street Railways, Ltd., has been authorized by the railroad commission to discontinue street car service on 40th Street and a private right-of-way from 41st Street and Piedmont Avenue to 40th Street and San Pablo Avenue in Emeryville, subject to the condition that East Bay Motor Coach Lines, Ltd., shall commence simultaneously the operation of an extension of its bus service over a specified route. Permission is also granted to the coach company to abandon a portion of its Excelsior Avenue bus line simultaneously with the establishment of motor bus service on 40th Street.

✦

Washington, D. C.—The Public Service Commission has authorized the Capital Traction Company to shift from street car to bus service on the F and G Street loop, but has denied the Washington Railway & Electric Company's request to discontinue its bus line to Foxhall Village and Potomac Heights because of lack of patronage. The east terminal of the Foxhall Village-Potomac Heights bus line will, however, be moved from Wisconsin Avenue and Reservoir Road to Fifteenth and K Streets northwest so as to provide a direct downtown service. Discontinuance of the bus line now operated at nights, Sundays, and holidays between Potomac Park and Nineteenth Street and Pennsylvania Avenue has been ordered for the same reason.

(*Continued on Page* 273)

Service to Continue in Boise

The threat made by the Boise Street Car Company, now serving Boise, Idaho, by bus, to discontinue operations on April 1 was rescinded. It was caused by the recent passage by the Legislature of an automobile license tax increase. Following the announcement that service would be withdrawn, the attorney-general ruled that the company would be exempt from certain of the state fees. Meanwhile, the company has curtailed services and cut overhead expenses.

Under the new license, the company's annual vehicle tax increase was $2,400. Along with this tax the company pays a gasoline impost of $500 a month and other taxes. The company operated at a loss in 1929 and 1930, but continued service in the hope that legislative relief might be obtained. A bill was introduced covering this subject. It provided for a tax on the gross earnings on a sliding scale. The bill failed in the Senate, but during the period the bill was under consideration by the Legislature, both houses passed a measure to increase the license taxes. Company officials decided that operations under these conditions was impossible.

New Fare Schedule Suggested for Portland

Engineers of the Oregon regulatory commission have made the following recommendations relative to rates and service on the Pacific Public Service Company's railway in Portland:

Single cash fare of 7 cents; unlimited tickets in strips of ten, 60 cents; weekly pass with five tickets attached, 35 cents; limited school children tickets, 4 cents.

Further the commission has recommended that the utility spend $812,000 on modernization of rolling stock and other equipment.

The present cash fare charged by this utility is 10 cents per passenger, but a weekly pass is in effect. The municipality asked the commission to reduce the fare to 5 cents. The company contends that a combination of adverse circumstances renders it impossible to earn a reasonable return on the railway investment with even a 10-cent fare. With this the regulatory authorities agree in part. At a further hearing the matter of proposed free use of bridges and streets by the operator will be discussed.

Maryland Topic

(Continued from Page 270)

emphasized that the speakers can work effectively only when the company is producing a brand of service that they can sell. It is difficult to take employees out of all departments and make salesmen or advertising men out of them, so that care is necessary in the selection of representatives. He said the industry was relatively untrained in the problem of meeting competition, and found it difficult to visualize the application of merchandising to the daily jobs of managing an electric railway. As to the present business situation, Mr. Gordon stated that the electric railways have held up remarkably well. Employment has been relatively stable, a fact noteworthy since the electric railways are the largest or nearly the largest employers of labor in every community.

In the discussion, H. B. Potter pointed out that the electric railway man is doing a job that is well worth while. He felt there have been too many apologists and too few real representatives of the railways. The railway man should have no inferiority complex.

At the close of the afternoon session Adrian Hughes, Jr., of the United Railways & Electric Company was elected president for the ensuing year. Other officers elected are F. A. Mitchell, vice-president; W. A. Tobias, treasurer, and D. E. Kinnear, secretary. R. E. Town, J. E. Heberle, M. J. O'Connell, F. A. Alexander, R P. Monsal and G. P. Mangan were chosen for the board of directors.

Wage Readjustment Proposal in St. Louis

With the purpose of operating within its income until the present general depression passes and at the same time carry the maximum number of employees, the St. Louis Public Service Company has suggested that its workers agree to accept monthly reductions in pay up to 10 per cent of their present salaries, contingent upon the company's income for the month.

Under the plan, which would be tentative and in effect for six months, effective on May 20, the company would continue to pay officers and other employees 90 per cent of their present wages and at the end of the month, if interest requirements have been earned over and above the operating expenses, the other 10 per cent would be dispersed for that month.

If the company should fall short of earning enough to meet the interest payments for any month it could devote up to 10 per cent of the employee's wage to help make up the interest deficit.

Under no circumstances would earnings be applicable to security holders in any month in which employees' wages were not paid in full.

Financial News

(Continued from Page 272)

Rochester, N. Y.—The New York State Railways, Rochester Lines, failed by $367,410 to make the guaranteed 6 per cent return on operations under service-at-cost during the year ended Dec. 31, 1930. City Railway Commissioner Barnes says the adverse contributing facts were the economic depression and the increased use of the private auto-

Coming Meetings

May 4-7—International Chamber of Commerce, Washington, D. C.

May 14-15—Middle Atlantic States Equipment Men's Association, Washington, D. C.

June 8-11—National Association of Purchasing Agents, Royal York Hotel, Toronto, Ont., Canada.

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

Aug. 6-8 — Pacific Claim Agents Association, Stockton, Cal.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Buffalo, N. Y.—Employees of the International Railway, under the Mitten co-operative plan now own 11 per cent of the common stock; 12 per cent of the preferred shares and $600,000 par value of the company's bonds. Three new representatives of the employees have been elected to the board. They are Stephen J. Hanley, president of the company's co-operative association; George Del Vecchio, vice-president, and Joseph B. Ross, chairman of the general committee under the Mitten co-operative plan. Mr. Hanley is a traveling auditor; Mr. Del Vecchio is a track worker and Mr. Ross is a clerk in the track, bridges and building department. They succeed Samuel Haslam, W. W. Owens and Isidor Spati on the board.

◆

Canton, Ohio—This city on April 19 had only a bus transportation system with the suspension of railway service by the Canton Traction Company. Emergency transportation service is being rendered by the Canton Motor Coach, Inc., which has a franchise covering the rest of the city. Railway service between Canton and Massillon, also scheduled to be suspended on April 19, will continue until after a hearing scheduled before the Public Utilities Commission on May 10.

◆

New York, N. Y. — For the eight months ended February the number of passengers carried on the subway division of the Interborough Rapid Transit Company, the Manhattan Railway and the New York Rapid Transit Company, operating subsidiary of the Brooklyn-Manhattan Transit Corporation, declined to 1,316,588,484, off 30,771,557, or 2.3 per cent from the corresponding preceding period. Passenger revenues declined to $65,829,423, off approximately $1,500,000 from the twelve months ended February, 1930. In consequence, the city's investment in the subway lines under Contract 3 again will be on a non-paying basis.

◆

Brooklyn, N. Y.—Certificates for 6,000 shares of Brooklyn-Manhattan Transit Corporation preferred stock were recently turned over to 1,400 employees of the system who bought it under the employees' stock ownership plan, the first payment having been made in 1926. Deductions from salaries were made at the rate of $1 a share every month for 55 months. In totals, the cost to the employees was only $330,000, whereas the present market quotation gives their holdings a value of $540,000. The stock was offered at $75 a share, the difference between $55 and $75 being made up by dividends during the time of payment with 5 per cent charged for interest on deferred payments.

Regulation and Legal

New York, N. Y.—Prof. William Z. Ripley of Harvard, said, in lecture at Columbia University, that creation of a cabinet post—secretary of transportation —to take over administrative functions of Interstate Commerce Commission, would result in enforcement of discipline in the railroad industry, one of the things it needs to get out of its present condition. He predicted that such a cabinet post eventually would be created.

(Continued on Page 274)

Transportation to Airport Is Specialized Service

Airplane passengers demand a specialized type of public transportation service to and from landing fields, it was stated in a recent order of the California Railroad Commission, to which it appeared clear, from the testimony, that airplane passengers prefer not to use regular bus or street car service in traveling between the landing field and their ultimate destination.

An application was filed by Joe Ferrant for authority to establish service as a common carrier for the transportation of passengers and their baggage between four locations in Los Angeles and the airports in Glendale and Alhambra, using automobiles and charging a fare of 75 cents or $1, according to the point of origin.

The Original Stage Lines, Motor Transit Company and Pacific Electric Railway contended that they offered transportation service sufficient and satisfactory to meet the public demand.

The applicant said he proposed to arrange his schedules so that they will correspond with the arrival and departure of airplanes, which of necessity are somewhat irregular. The service is to be limited to passengers of Western Air Express and Transcontinental Air Transport, using either the Glendale or Alhambra airport, and is not to include any intermediate service.

In the event of forced landings at certain designated fields, applicant proposes to keep in touch with airplane officials and meet all airplanes arriving on such schedules.

Officials of both Western Air Express and Transcontinental Air Transport testified that the service proposed was essential to the adequate ground transportation of their passengers and that by far the larger percentage of such passengers preferred a specialized service of this type to the ordinary methods of traveling to and from the landing field.

Pacific Electric Railway operates from the downtown section of Los Angeles to Glendale, making ten stops en route and transferring to buses such passengers as desire to reach the airport. The wait for a bus would be anywhere from 20 to 50 minutes. Its affiliate, Motor Transit Company, operates a ten-minute bus service to Alhambra airport and had offered to render a service on a leased car basis with a guarantee of $30 per day for each car so leased.

◆

Washington's New Parking Law in Effect

After the first day's trial of Washington's new drastic parking law, city officials expressed themselves as being satisfied that under it the movement of traffic was expedited. The new law became effective on April 22. It divides the downtown section of the city into zones, prohibits parking in the central business district until after 9:30 in the morning and limits parking to one and two hours respectively in zones surrounding the central area. In addition, parking is prohibited on the flow sides of streets leading to the business district during rush hours, and all angle parking is abolished.

Material improvement in electric railway schedules is expected as the result of the new parking laws and other new traffic regulations that have been invoked. One of the new traffic regulations prohibits the making of "U" turns on F and G Streets, important street car routes. Another new regulation has put a stop to the cruising of taxicabs on the streets of dense traffic.

Within a short time steps will be taken under authority granted by Congress last session to prevent the use of sidewalk terminal stations for interstate buses. The Public Utilities Commission has arranged a conference with bus operators next month at which it is hoped the way may be paved for the construction of a union bus terminal providing off-street loading facilities.

City officials have warned the operators of one interstate bus terminal that they must refrain from allowing their buses to be parked at an angle to the curb. Further violations will lead to the arrest of bus drivers, it is stated. Traffic officials have also issued orders to prevent trucks from backing into the curb to load or unload merchandise.

Regulation and Legal

(*Continued from Page* 273)

Richmond, Va.—The State Motor Vehicle Commissioner is checking all buses and trucks operating on state highways to determine if load weights comply with restrictions of the highway department. Court proceedings are threatened against violators of the state's regulations.

◆

Syracuse, N. Y.—The New York State Railways has obtained an order from Judge Bryant broadening the temporary injunction issued a few weeks ago which further restrains the Syracuse Auto Rental & Taxicab Company from encroaching on the railway's business. The original injunction directed the taxi operators to refrain from carrying passengers on return trips to the downtown section at 10 cents each. The new order restrains the cab company from parking its cars at places other than designated taxi stands and from soliciting fares by cruising on railway streets.

◆

Baltimore, Md.—The Sun Cab Company, Inc., has won its contest with the Public Service Commission, which ordered the company to provide $10,000 and $20,000 liability insurance for each of its taxicabs or to set up an indemnity reserve of $100,000. Later the commission reduced these amounts to $5,000 and $10,000 or a reserve of $60,000. The Court of Appeals held that the requirement imposed by the commission's order is legislative, and that those who use the roads are not required to do anything except pay their taxes and the license fees required by the motor vehicle act, until the Legislature acts in the matter.

General

Cleveland, Ohio—Offices of the accounting division of the Cleveland Railway have been moved to the ground floor of the new Midland Bank Building in the Union Terminal area to expedite ticket checking. Other offices of the company will be moved early this summer to quarters being prepared on other floors of the building. The railway's offices in the Hanna Building have been gradually vacated since the first of the year. The Midland Bank Building quarters will not occupy as much floor space as in the Hanna Building.

Harrisburg, Pa.—Chairman W. D. B. Ainey, of the Pennsylvania Public Service Commission, was called before the House of Representative committee investigating the commission and the utilities on April 17. He was wheeled into the room and up to the witness stand in his invalid's chair and immediately was subjected to an examination as to the activity of the commission in supervising the financing of the utilities.

◆

Denver, Col.—Lease of 5½ lots of the Denver Tramway interurban loop to the Loop Auto Parking Company, Inc., for ten years has been announced as a result of the tramway's abandonment of several tracks which have not been used for more than a year. Room for more than 125 cars, a service station and four entrances from Fourteenth and Fifteenth and Curtis and Arapahoe Streets will be made by the parking company.

◆

San Francisco, Cal.—President Samuel Kahn, of the Market Street Railway, has placed the silver non-accident trophy permanently in the possession of 28th Street division for having the best record for 1930. It was believed the contest had six months to go, but it was decided that since 28th Street had a definite lead, there was no good reason for not awarding it.

◆

Chicago, Ill.—A fleet of highway vehicles, trains, locomotives, watercraft, old and new, added to airplanes and dirigibles overhead, will be utilized to tell the story of 100 years of advance in transport, Edward Hungerford, of the New York Central Lines, stated on April 8, over a radio network, in describing plans for the transportation exhibit at the Century of Progress International Exposition to be held here in 1933. Transportation will be dramatized at Chicago in a manner that will excel any similar exhibit hitherto staged, Mr. Hungerford told the radio audience. The transportation display is to be called the "Travel and Transport Show."

◆

St. Louis, Mo.—The Board of Public Service has referred to Director of Streets and Sewers Brooks for recommendation a proposal that the curbed-off area on Delmar Boulevard between Kingshighway and Clara Avenue be eliminated, that the strip be paved and trolley poles placed on the sidewalks instead of the center of the street so that all vehicular traffic can use the roadway for its entire width. Officials of the St. Louis Public Service Company estimate it would cost the company $120,000 to make the change, including its share of the new paving. The parkway strip is 26 ft. wide and the company would have to pave about 18 ft. of this. In addition, the movement of street cars would be greatly retarded. Three times bills for the removal of the parkway have been vetoed by the Mayor.

◆

New York, N. Y.—The Appellate Division has dismissed the proceedings brought by the Second Avenue Railway and the New York Railways Corporation for a review of the orders of the Transit Commission, directing them to install "dead-man's buttons" on all their one-man cars. Under the ruling the order must be complied with. In substance, the companies contended that to comply with the order would burden them unduly because of the cost.

PERSONAL MENTION

Messrs. Bradley and Moynihan Are Advanced

Stanley Clarke was re-elected president of the St. Louis Public Service Company by the recently elected board of directors. Other officers named are: S. W. Greenland, vice-president; T. E. Francis, general attorney; J. D. Evans, auditor; W. deW. H. Bradley, secretary, and W. R. Moynihan, treasurer. Mr. Bradley has been assistant secretary and Mr. Moynihan assistant treasurer.

Kaiden-Keystone Studios

W. deW. H. Bradley

Robert E. Maloney of the law firm of Boyle & Priest, and Tom K. Smith, president of the Boatmen's National Bank, have been elected directors to succeed the late Judge Henry S. Priest and George W. Wilson, of the Mercantile Commerce Bank & Trust Company. All other directors were re-elected.

Mr. Bradley was born in Gloucestershire, England, on Jan. 17, 1888. He was graduated from Cambridge University and is a member of the English bar. Shortly after the outbreak of the World War he joined the British Expeditionary Forces, with which he served from 1914 to 1918. He came to this country with the British Military Commission in the rank of Major, and he assisted in the training of American troops at Camp Devins near Boston.

At the close of the World War, Mr. Bradley returned to this country. In 1919 he was with the Boston Legal Aid Society in Boston. Later he took a position in the patent department of the United States Rubber Company at New York. He remained with that company until the spring of 1922 when he was made secretary of the Harbor Dry Dock Company, New York City.

While in New York he had become acquainted with Stanley Clarke, president of the St. Louis Public Service Company, and J. K. Newman, president of Newman, Saunders & Company, Inc., who later reorganized the St. Louis railway system. In the early fall of 1924, Mr. Bradley became secretary of the reorganization committee of the United Railways at St. Louis and he continued in that capacity until Dec. 1, 1927, when the reorganization was perfected. As soon as the properties of the United Railways were taken over by the St. Louis Public Service Company, Mr. Bradley was elected assistant secretary of the new company. Since that time he has performed all of the duties of secretary, a position never officially filled until now.

Mr. Moynihan was born in Ashland, Mass., on Dec. 17, 1892. He was educated in the primary and high schools of Holliston, Mass., and later studied law at Northeastern College, Boston, Mass. His first job was with the Eastern Massachusetts Street Railway in the summer of 1910, when he was a chainman for an engineering gang. In 1911 he joined the Boston & Albany Railroad, and for seven years held various positions in the engineering, auditing and legal departments of that road.

When the United States entered the World War he volunteered for service with the Fourteenth Engineers as a private, but came out with a first lieutenant's commission and is now a captain in the Engineer's Reserve Corps. At the close of the war, he rejoined the legal department of the Boston & Albany.

In France Mr. Moynihan served as adjutant to Col. Albert T. Perkins, who was in charge of all of the light railways for the American forces in France. Shortly after the close of the war, Colonel Perkins was made general manager for Rolla Wells, receiver for the United Railways, and early in 1920, Colonel Perkins induced his old adjutant to accept the post of assistant treasurer for the receiver.

In the latter part of 1923 the health of James Adkins, treasurer for the receiver, began to fail. Mr. Moynihan was then made treasurer, but Mr. Adkins continued to serve the railway as consulting treasurer until Dec. 25, 1923, when he died. On Dec. 1, 1927, the railway was taken over by the St. Louis Public Service Company, as successor after sale at foreclosure and Mr. Moynihan was then made assistant treasurer of the new company, the official position of the treasurer not being filled then.

In addition to his position of treasurer of the St. Louis Public Service Company, Mr. Moynihan is president of the Public Service Savings & Loan Association, the largest association of its kind in St. Louis and St. Louis County exclusively. The membership is composed of employees of the railway and their families and it has assets of more than $5,500,000.

Kaiden-Keystone Studios

W. R. Moynihan

◆

M. W. Rew Superintendent of Transportation at Cleveland

Morse W. Rew, formerly superintendent of motor coach operations, of the Cleveland Railway, Cleveland, Ohio, has been advanced to superintendent of transportation in charge of all coach and car operations. The position has been vacant for some time. Leonard Rose, formerly assistant to Mr. Rew, will head the division for maintenance of motor coach equipment.

M. W. Rew

Also announced recently was the resignation of Charles H. Stanley, brother of the late railway president, John J. Stanley, as superintendent of materials and stores. Mr. Stanley had been in the company's employ 21 years. A. C. Kennedy, formerly assistant to Mr. Stanley, was named to succeed him.

Under the changes at Cleveland, the motor bus department, which had been operating as a separate organization, is fully co-ordinated with the rail operating organization. Bus maintenance is placed under the direction of Tom Nicholl, superintendent of buildings and equipment, but direction of bus operations is under Mr. Rew as superintendent of transportation, with authority over both cars and buses. Previously the track and line department personnel reported direct to President Alexander, but henceforth will come under the direct supervision of Ralph Emerson, vice-president and general manager.

Mr. Rew brought to his work at Cleveland wide experience as a traffic expert and engineer. He was graduated from Grinnell College, Iowa, and from the Massachusetts Institute of Technology. After completing his course at "Tech," Mr. Rew remained there two years as instructor in civil engineering. Then he entered upon engineering work in traffic and allied fields which resulted in his serving in Boston, Cincinnati, Pittsburgh and other cities. Especially did he do notable work as chief engineer of the Pittsburgh Transit Commission, and as assistant to A. M. Taylor, who was in charge of the division of passenger transportation of the Emergency Fleet Corporation.

Merchant, Banker and Railway Man P. R. T. Receivers

E. L. Austin, Dr. Herbert J. Tily and Edward Hopkinson, Jr., named receivers by Judge McDevitt to handle the affairs of the Philadelphia Rapid Transit Company will not take office, so the court has announced, until the court proceedings have ended. All the men named are widely and favorably known in Philadelphia, but of the three, only Mr. Austin has had practical experience in transit affairs. He is widely known as the director-general of the Sesqui-Centennial Exposition. He was born in Maryland in 1880, and went to Philadelphia in 1900, entering the employ of the Union Traction Company, one of the roads now included in the P.R.T., system, as a conductor. When the P. R. T. took over Union Traction he was transferred to the office force. He worked as general auditor and then as comptroller in charge of financing and accounting. He established the firm of Austin-Johnson, Inc., general engineering and accounting, in 1923.

Dr. Tily is president of Strawbridge & Clothier, chairman of the public utilities committee of the Philadelphia Chamber of Commerce, and vice-president of the Philadelphia Business Progress Committee. He was born in England in 1866 and started at thirteen years as cash boy in the store he now heads.

E. L. Austin

Mr. Hopkinson is chairman of Mayor Mackey's finance commission and a member of Drexel & Company and J. P. Morgan & Company. He was born in Philadelphia in 1885, and was graduated from the University of Pennsylvania. He completed his law course in 1910 and was admitted to the bar the same year, joining the firm of Dickson, Beitler & McCouch, which he left in 1926 to join Drexel & Company.

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Harry T. Edgar Retires

Harry T. Edgar, associated with Stone & Webster in managerial work in various parts of the country for 32 years, has resigned from that organization. Mr. Edgar is a native of Griggstown, N. J. He entered the utility field in 1886 as an employee of the Edison Electric Illuminating Company, New Brunswick, N. J., soon going to New York with the engineering department of the Edison Electric Light Company, a predecessor of the General Electric Company. After seven years of construction work he became secretary and general manager of the Georgia Electric Light Company, Atlanta. In 1897 he entered the sales field and spent two years in the electrical apparatus market in New York and New England.

Since he joined Stone & Webster in 1899, Mr. Edgar has served as manager of the Lowell Electric Light Corporation; El Paso Electric Company; Northern Texas Traction Company, Fort Worth; and Seattle Electric Company, including both power and railway interests.

For some years now Mr. Edgar has made his headquarters at Boston, serving as district and division manager of the Middle West district, and operating railway and power properties centering at Houghton, Mich., Paducah, Ky., the Mississippi River Power Company at Keokuk, Iowa, and lighting systems at Keokuk, Fort Madison and Dallas City.

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James W. Welsh Becomes Consultant in Traffic Field

James W. Welsh, assistant to President Joseph H. Alexander of the Cleveland Railway, has resigned to head his own organization as a consulting engineer specializing in traffic problems. He will establish New York headquarters at Room 1310 in the Equitable Life Building, 393 Seventh Avenue, New York, with a branch office in Cleveland. He will make traffic studies and surveys for municipalities and transportation organizations. Mr. Welsh went to Cleveland on Sept. 1, 1929, from the post of executive secretary of the American Electric Railway Association shortly after the Van Sweringens, through Metropolitan Utilities, Inc., took control of the Cleveland Railway.

As a specialist in traffic engineering, Mr. Welsh devoted much of his time at Cleveland to studies for the proposed coordination of rapid transit and the surface lines, and of the application of the zone fare principle to Cleveland's needs. According to Colonel Alexander, these studies by Mr. Welsh have made possible increased speeds on the local system and have resulted in many operating economies. Colonel Alexander said:

> We feel disappointed in losing Mr. Welsh, for he has made a fine record in the field of research with this company. However, he feels that his new enterprise will offer him a wider field for his abilities, and we wish him success.

Mr. Welsh went to the Cleveland Railway with a national reputation both as an electrical engineer and a traffic expert. Early in his engineering career he became intensely interested in traffic problems presented with the expansion of cities, and in all of the posts he has held he has devoted himself unremittently to the study of these problems. As secretary of the association Mr. Welsh was brought constantly face to face with this problem as one of the major questions before the industry. Incidentally, in that post he was afforded unusual opportunities for study not only at first hand, but as a consequence of the extent that consideration of the problem entered most discussions of matters coming before the association for consideration. Also in 1924 as a member of the special investigating committee which studied transportation conditions in England, France and Switzerland and reported progressive developments to American operators he was able to broaden his grasp of the subject. To a representative of Electric Railway Journal, a few days ago, he said:

> I have felt for a long time that the traffic problem in our major cities should be approached from a new angle. We are too inclined to think of the traffic situation merely as a problem of law enforcement, rather than as an engineering problem.
>
> The continued growth and welfare of cities depends as much on efficient use of our present transportation facilities as on the providing of additional ones. In view of the heavy tax burdens of most communities, we should be sure we are getting 100 per cent use from the facilities we have at hand before assuming new burdens.

Born in Springfield, Ohio, Mr. Welsh obtained degrees at Wittenberg College, Harvard University and Massachusetts Institute of Technology. He was graduated as a Bachelor of Science in electrical engineering from the last named institution in 1903.

J. W. Welsh

After periods in the service of the National Tube Company and the Westinghouse Company, he went with the Pittsburgh Railways in 1906 as an assistant electrician. In 1910 he was made electrical engineer and three years later, as an additional duty, took charge of the traffic department.

During the war he was transportation engineer for the Emergency Fleet Corporation. In that capacity he surveyed transportation facilities to the various ship yards along the Atlantic coast. After the war he was retained as special engineer by the American Electric Railway Association and two years later was promoted to executive secretary. During his ten-year term he was constantly consulted in the traffic surveys undertaken by electric railways.

During the readjustment period following the war, Mr. Welsh assembled the data and assisted in the preparation of the case for the electric railways presented at Washington before the Federal Electric Railway Commission.

Adrian Hughes, Jr. Elected President Maryland Body

Adrian Hughes, Jr., who has been elected to the presidency of the Maryland Utilities Association for the ensuing year, is one of the more prominent of the younger executives in the transportation industry. While nearly all of Mr. Hughes' operating experience has been with the United Railways & Electric Company of Baltimore, he has served in several important positions in different branches of the work. At present he is on the executive staff of the general manager. Until the operating departments were consolidated recently he was superintendent of bus transportation, having been appointed when the position was created in 1925. During his incumbency there has been a steady expansion of the bus system of the Baltimore property.

Underwood & Underwood

Adrian Hughes, Jr.

Before his connection with the bus system Mr. Hughes had served for more than ten years in the power department, the last five years as superintendent of power. Prior to assuming charge he was an engineer in the distribution division for four years and assistant to the superintendent of power for nearly two years.

Mr. Hughes began his professional career with the Carnegie Steel Company in 1912, and in November of that year was made general foreman of the electrical department of that company, which position he relinquished when he joined the United Railways in 1914. He was born in Baltimore, and received the degree of A.B. from Rock Hill College in 1908. His technical education was obtained at Cornell University, from which he was graduated in 1912 with the degree of M.E.

Apart from his duties, Mr. Hughes has long been active in association work. He has been one of the leaders in the Maryland Utilities Association since its formation eight years ago. As vice-president and chairman of the program committee he was largely responsible for the successful meeting recently held in Baltimore. For some time he has presided over the meetings of the transportation group. For many years he has been among the leaders of the American Electric Railway Association. At present he is a member of the entertainment committee and a member of the executive committee of the Transportation and Traffic Association. In former years he was active on the power committees of the Engineering Association. He has contributed much to the research work on bus operation and on substation development by his active participation in association affairs. Articles by him based on his intimate study of transportation and engineering subjects at first hand have appeared in Electric Railway Journal and other publications.

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A. W. Leonard Made Chairman at Seattle

A. W. Leonard has resigned as president of the Puget Sound Power & Light Company, Seattle, Wash., to become chairman of the company. He has been connected with the Stone & Webster interests for 36 years, more than half of which have been spent in Seattle. He was made president of the Puget Sound company on Nov. 1, 1914, upon the death of Jacob Furth. Under his presidency the company won the Charles A. Coffin medal in 1928 and the Forbes public service cup in 1929.

Mr. Leonard was born in Monmouth, Me., in 1873. His early affiliations include the Edison Electric Illuminating Company, Brockton, Mass., of which he was superintendent and manager. In 1901 he went to Houghton, Mich., as superintendent of the Houghton County Electric Company, later becoming manager, and in 1905 he was appointed manager of the Minneapolis General Electric Company, later becoming vice-president. Still later he became district manager of the Stone & Webster interests in the Middle West, moving to Seattle in 1912.

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Messrs. Hannaford and McPhail Named to Winnipeg Board

The Insull interests, of Chicago, having acquired a very substantial block of shares in the Winnipeg Electric Company, President Anderson of the company suggested at the recent annual meeting that these interests be represented on the board by two directors to fill vacancies. To that end he suggested the names of Foster Hannaford, Chicago, and J. A. McPhail, Sault Ste. Marie, Ont. Incidentally, Mr. Anderson said that Nesbitt, Thomson & Company, and the Power Corporation continue their interest in the company as heretofore. In other words, the Insulls have acquired common stock on the market to the point where they now have a very substantial interest in the company. The advent of these interests in the affairs of the company will not mean any change of policy of management in the light, power and railway system. Other directors were reelected.

Foster Hannaford

Mr. Hannaford is a former St. Paul man, son of J. M. Hannaford, former president of the Northern Pacific Railroad and now vice-chairman of the board of this road. He was graduated from the Sheffield Scientific School of Yale in 1908, and after two years' study abroad returned to enter the service of the Westinghouse Electric Company in East Pittsburgh, as an apprentice. He was made superintendent of the Twin City Rapid Transit Company in 1924, later becoming associated with the firm of Noyes Brothers & Cutler, St. Paul, wholesale druggists. Last June Mr. Hannaford joined the Middle West Utilities Company, Chicago, and is now assistant to the president of that company.

J. A. McPhail

Mr. McPhail is a man of wide corporation experience and a lawyer. He was born at Bruce Mines, Ont., on Feb. 7, 1878, and was graduated from Osgood Hall, Toronto, in 1900. In September of that same year he was admitted to the bar. Among his many other activities he was an alderman at Sault Ste. Marie for four years and was Mayor two years.

He is president of the Great Lakes Power Company, Algoma District Power Company, International Transit Company, Lake Superior Power Company, Algoma Pyrites Company, St. Mary's River Construction Company, Superior Alloys, Winnipeg Heating Company, and Northern Public Service Corporation. He is vice-president and director of the FitzGerald Laboratories of Canada, Middle West Utilities Company of Canada, and Stone Lumber Company. He is a director of Insull, Son & Company of Canada, and chairman of the National Utilities Corporation.

◆

Professor Riggs in Engineering Practice

Henry Earle Riggs will devote his attention to the practice of engineering, giving particular attention to problems growing out of railroad and public utility regulation, with offices at Ann Arbor, Mich. His retirement, on June 30, 1930, from active administrative and teaching work at the University of Michigan, now permits him to devote his entire attention to engineering practice.

E. J. Jonas, Ohio Equipment Man, Heads C.E.R.M.M.

E. J. Jonas, superintendent of equipment of the Cincinnati Street Railway, Cincinnati, Ohio, was elected president of the Central Electric Railway Master Mechanics' Association at the meeting held at Toledo, on April 9. Two years ago he was made vice-president of the association and at the same time elected chairman of the program committee.

Mr. Jonas has been prominent in mechanical and electrical engineering circles for some time. In addition to the active part that he has long taken in the affairs of the Central Association, he has also contributed to the work of the Association of Equipment Men, Southern Properties, by participating in its affairs. Mr. Jonas knows his subject thoroughly and knows how best to impart information about it to others, a most important talent. Moreover, he writes with ease and grace and has been a frequent contributor to Electric Railway Journal on cars, maintenance and other topics which he has made peculiarly his own. It would, indeed, be difficult to appraise the value of his contributions to the industry as a participant in association affairs and as an author, but these contributions rank high in the annals of the progressive thinking in the industry.

E. J. Jonas

Mr. Jonas' work at Cincinnati and on other properties has won for him regard as an authority on car design. That he is unusually resourceful is attested by the fact that he has perfected many important mechanical improvements for electric railway equipment. In the planning and construction of the new $1,000,000 Winton street car repair shops, built in 1927 by the Cincinnati Street Railway, he played an important part.

Mr. Jonas is a native Cincinnatian. He attended Walnut Hills High School and received his technical training at Ohio Mechanics Institute from which he was graduated as an electrical engineer. His first position in the electric railway field was with the St. Louis Transit Company in the power maintenance department. From 1902 to 1921 he was employed by the Cincinnati, Georgetown & Portsmouth Traction Company, in charge of power and roadway. He came to the Cincinnati Traction Company in November, 1921, as assistant to F. J. Venning, superintendent of equipment and overhead lines. Shortly after the Cincinnati Street Railway resumed the operation of its property in 1926 as successor to the Cincinnati Traction Company, Mr. Jonas was appointed superintendent of equipment, which position he holds at the present time.

Partly as a compliment to Mr. Jonas and partly because the electric railway engineers are interested in the improvement program which has been developed by the Cincinnati Street Railway, the next meeting of the Master Mechanics' Association will be held in Cincinnati during the month of September.

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New Purchasing Agent at Detroit

Walter S. Brieden, assistant purchasing agent of the Department of Street Railways, Detroit, Mich., has been promoted to purchasing agent by the Street Railway Commission, filling the position vacant since the removal of Harold S. Owen, a Bowles appointee, shortly after the advent to office of Mayor Frank Murphy. For ten years Mr. Brieden has been connected with the purchasing department of the Department of Street Railways, operating the municipal railway and bus lines. At three different times in the past he has been acting purchasing agent. Before he entered the service of the city, Mr. Brieden was with the purchasing departments of the Timken Detroit Axle Company and the Wadsworth Manufacturing Company in capacities in which he gained wide experience.

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Bert Gray Heads Houston Companies

Bert Gray has been elected president and general manager of the Houston Electric Company and Galveston-Houston Electric Railway, Houston, Tex., to succeed Jeff L. Alexander, who has been transferred to New York by Stone & Webster. Mr. Gray is a native of Ohio. Prior to his becoming connected with the Houston Electric Company, 25 years ago, as a stenographer and clerk, he was deputy county clerk of Fort Bend County. He has been claim agent of the Houston Electric Company, Galveston-Houston Electric Company and Galveston-Houston Electric Railway for several years.

Bert Gray

J. F. McLaughlin Elected President of Seattle Utility

J. F. McLaughlin has been elected president of the Puget Sound Power & Light Company, Seattle, Wash., to succeed A. W. Leonard, made chairman of the board. Mr. McLaughlin brings to his new executive position a broad background of practical engineering experience. Equipped with a high school education, he started in the public utility field twenty years ago with the Woonsocket and Pawtucket (R. I.) properties in a clerical position. While doing this office work he took special business and technical courses at Brown University, and it was not long before he was appointed assistant to the manager of the utility company. Subsequently he was sent to Texas to assist in reorganizing the Eastern Texas Electric Company, later being made superintendent of light and power for the El Paso Electric Company and then manager of the Baton Rouge Electric Company.

J. Frank McLaughlin

When the Engineers Public Service Company acquired Virginia Electric & Power Company in 1925, Mr. McLaughlin was made vice-president in charge of the Norfolk division. He was later appointed operating vice-president at Richmond. From there he was called back to Texas as district manager in charge of all of the Texas, Louisiana and New Mexico properties. While serving in this capacity he was elected president of the Virginia Electric & Power Company, and from there he was made operating executive of the Stone & Webster Service Corporation, having charge of the operation of twenty utility companies located in the south.

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Guy C. Hecker, secretary of the American Electric Railway Association, contributed to the pre-convention issue of *The Foundry,* dated April 15, a brief article devoted to the diversity of castings required by electric railway lines. He said, in effect, that the foundries get a good share of the $1,000,000 which is spent by the electric railways daily for new plant, equipment and supplies. For the benefit of those connected with the foundry business who might not be fully informed on the extent of the electric railway industry, he reviewed statistically the magnitude of the electric railway industry.

W. W. Cooper Retained by California Commission

Walter W. Cooper has been retained to take charge generally of the preparation of cases before the California Railroad Commission, the employment to commence as soon as Mr. Cooper can bring to a close his existing engagement with various California cities, by which he is employed in rate matters. He will enter upon his new work not later than July 1.

Mr. Cooper will maintain a constant check on the rate structures and earning conditions of the various utilities, and coordinate the work and records of the several departments of the commission in handling rate cases. He has had a broad and valuable training and experience in representing the public interest in rate matters. The California Commission has long felt the serious handicap its department experts were under in being required to build up a rate case, testify in the same, and then act as cross-examiners of utility witnesses. In this work it is expected Mr. Cooper will be a great benefit to its present staff.

Mr. Cooper was graduated from the University of Minnesota. He has been associated with C. L. Pillsbury, consulting engineer, in connection with the valuation of various public utilities in the District of Columbia for the utility commission there, with the late Dr. Edward W. Bemis in making a valuation of the People's Gas, Light & Coke Company for the city of Chicago, and with the late Dr. Delos F. Wilcox in valuation work or reports on various light and power companies and electric railways. He was employed by the East San Francisco Bay cities in the recent telephone rate case, and has represented the cities of Oakland, Sacramento, Stockton, Tracy, Fresno and Minneapolis in utility matters.

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A. J. Goedjen Heads Wisconsin Association

A. J. Goedjen, Green Bay, Wis., has been elected president of the Wisconsin Utilities Association. Mr. Goedjen is division manager of the Wisconsin Public Service Corporation.

E. J. Steinberg, service engineer of the Milwaukee Electric Railway & Light Company, Milwaukee, has been elected vice-president of the association. Ewald Haase, vice-president of the Milwaukee Gas Light Company, has been re-elected treasurer.

Mr. Goedjen has had extensive training with public utility companies in the Middle West. A graduate of the University of Wisconsin, he took the General Electric Company's test course for two years, and then spent one year drafting and designing in the engineering department of the Commonwealth Edison Company. He served for several more years as superintendent of the meter and testing department and later as assistant in the electrical department of the Milwaukee Electric Railway & Light Company.

He then became electrical engineer of the Merchants Heat & Light Company, Indianapolis, in which capacity he supervised the reconstruction of all the electric lines and substations and the electrical equipment of the power plants of that company. He returned to Wisconsin in 1916 as assistant manager of the Wisconsin Public Service Corporation at Green Bay, and then affiliated himself with the Menominee & Marinette Light & Traction Company in the capacity of manager for six years; here also he played a prominent part in the rebuilding of the property.

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M. C. Smith Takes Over El Paso Post as President

M. C. Smith has taken up his duties at El Paso, Tex., as successor to F. J. Gannon, president of the El Paso Electric Company, promoted to the Tampa Electric Company, Tampa, Fla. At an informal luncheon arranged in his honor at noon on March 24, Mr. Smith had an opportunity to meet heads of all departments in the light and power and railway divisions.

M. C. Smith

The new chief executive at El Paso brings to the company there the efficient handling assured by unusual capabilities, plus the benefits of a wide experience together with inherent qualities that should make him a prime favorite, both within the company circles and with the citizens of El Paso at large. At Baton Rouge, from which property he transferred to El Paso, Mr. Smith made a fine record and took an active interest in all constructive civic affairs. There he was a member of Baton Rouge's Industrial Commission of Five which did notable work in advertising the city's advantages as an industrial center.

His service as manager of the Baton Rouge Electric Company, Baton Rouge, La., and as president of the Louisiana Steam Products Company dates from 1926. Under his management, the latter company recently completed a 45,000-kw. power plant at Baton Rouge which embraces many features of construction unusual in power station practice. During the five-year period under Mr. Smith's management the Baton Rouge property made notable progress.

Mr. Smith is a native of Maine. He was graduated from the University of Maine in 1912. From 1912 until 1916 he was stationed at Sydney, Nova Scotia, with the Cape Breton Electric Company, Ltd. Beginning as student engineer, he worked upward through the positions of solicitor, purchasing agent and assistant to operating executives. He became superintendent of light and power, for the Cape Breton Electric Company, Lt., in November, 1915. The following spring Mr. Smith was assigned to the Brockton & Plymouth Street Railway as manager, later being transferred to the Lowell organization, where he gained considerable experience in electrical engineering.

The next step in his career was with the Nova Scotia Tramways & Power Company, to which he went in 1921, as superintendent of the light and power department, later also taking over the supervision of the tramway department. Returning to Sydney in 1923, Mr. Smith became manager of the Cape Breton Electric Company, Ltd., and remained there, in that position, until 1926 when he was sent to Baton Rouge as manager of the Baton Rouge Electric Company.

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A. S. Durrant Retires from General Electric

Arnold Stuart Durrant, for the past six years vice-president in charge of commercial relations of the International General Electric Company, Inc., has retired from active service and been made an honorary vice-president of the company following a connection of 40 years with the General Electric organization.

Upon formation of the International General Electric Company, Mr. Durrant was made manager of the Department of the Americas. In 1925 he was elected vice-president in charge of all commercial relations of that company. He is on the board of each of the subsidiary companies in Argentina, Brazil, China, Colombia, Cuba, Mexico, Porto Rico and South Africa, and vice-president also of those in Colombia, Porto Rico and South Africa.

Mr. Durrant was graduated from University College, London. After two years of further education in Brussels and Paris he returned to the British West Indies, where he was born. In 1890 he entered the employ of the Edison United Electric Company, out of which grew the Edison General Electric Company and later the General Electric Company. In 1896 Mr. Durrant went to Schenectady. In 1898 he had charge of apparatus sales in the foreign department, and in 1908 he was made responsible for the handling of all Canadian business.

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G. G. Landis Is Lincoln Chief Engineer

George G. Landis has been advanced to chief engineer of the Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Stable-Arc" welders and "Linc-Weld" motors. Mr. Landis was graduated from Ohio State University, where he completed the course in electrical engineering, receiving the degree of bachelor of science in electrical engineering. His first work was with the General Electric Company in the design of small motors. He later went to the Westinghouse Electric Company as sales engineer for central station equipment. Mr. Landis joined the Lincoln Electric Company eight years ago to assume charge of this company's experimental activities. Subsequently he was placed in charge of electrical design of both motors and arc welders, and some time afterward of mechanical design. Many of the Lincoln patents, both on arc welding equipment and electric motors, are the result of his ingenious efforts.

Otis R. Hill Master Mechanic at Omaha

Otis R. Hill has been appointed master mechanic of the Omaha & Council Bluffs Street Railway, Omaha, Neb., succeeding Thomas E. Wood, who is retired on a pension, effective June 11, when he reaches the age of 70 years. Mr. Hill went to Omaha from Springfield, Ill., where he was car and engine foreman for the Illinois Terminal Company. For many years he has been associated with several Illinois and Indiana railway companies. He studied electrical engineering at Millikin University. During the World War he was a captain and was commanding officer of the First Trench Mortar Battery. He is 41 years old.

Arthur Gaboury in Safety-First Teaching Post

Arthur Gaboury, secretary-general of the Province of Quebec Safety League, will in future be responsible for conducting classes in safety throughout the Technical Schools of the Province. Mr. Gaboury was notified of his appointment by L. A. David, secretary, Province of Quebec Legislature. Mr. Gaboury is one of the pioneers of the safety movement, having fostered safety-first practices when general superintendent of the Montreal Tramways. Seven years ago he was responsible for the foundation of the Province of Quebec Safety League, an organization that has grown until today it is recognized by the Provincial Government of the Province of Quebec as being an integral part of every-day life.

President Kyser Heads Memphis Campaign

W. D. Kyser, president of the Memphis Power & Light Company and Memphis Street Railway, and member of the law firm of Wilson, Kyser, Armstrong & Allen, Memphis, Tenn., has been made general chairman to head the group that is to stage the ten-year campaign for new payrolls, new purchasing power and permanently stabilized employment at Memphis, through advertising and industry-building activity. It is a $2,000,000 campaign to culminate in 1941 with a celebration of the 400th anniversary of DeSoto's discovery of the Mississippi. Mr. Kyser said:

> Memphis must start a movement entirely new, if we are to continue to provide employment for those who come here to live, as well as for our sons who are graduating by the thousands from our schools into a city that has yet to begin its major industrial development.

C. Thorbun Motor Transit Purchasing Agent

Since the discontinuance of the purchasing department formerly headed by Jack Sikking about a year ago, the company has had no general purchasing department. For the better handling of all purchases, C. Thorbun has been appointed purchasing agent for the Motor Transit Company, affiliated with the Pacific Electric Railway, Los Angeles, and J. C. Neph is now assistant purchasing agent.

OBITUARY

Harlow C. Clark

Harlow C. Clark, public relations counsel since 1920 for the Public Service Corporation of New Jersey, Newark, N. J., died on April 10 at his home in East Orange, N. J. Mr. Clark went to the post in New Jersey from that of editor of *Aera*, published by the American Electric Railway Association, after serving that paper for seven years. He was a newspaper man of wide experience, well-versed in civic affairs, and his counsel was widely respected in association affairs. One of his many worthwhile contributions to the industry was his presentation as author in 1920 while he was editor of *Aera* of the volume "Service at Cost Plans," an identical analysis of statutes, ordinances, agreements and commission orders then in effect, or proposed, together with a discussion of the essentials of local transportation franchises. It was a contribution invaluable to the conduct of this industry under the changing conditions of the last decade. This and his work on *Aera* established his place in the history of the industry indelibly.

Harlow C. Clark was modest and retiring almost to a fault. Without any fanfare he did most constructive civic work in several posts in Syracuse, and it was this work that attracted the attention of J. N. Shannahan, J. P. Barnes, C. Loomis Allen and other operators then engaged in electric railway work in Central New York, and won their admiration with the result that he was induced to leave Syracuse to take the post of editor of *Aera* which he filled so creditably.

Born in Syracuse, N. Y., Mr. Clark worked in the freight and transportation departments of the New York Central Lines and the Lehigh Valley Railroad, but in 1892 returned to Syracuse, where he entered the employ of the Syracuse *News* as a reporter. Later he was Sunday editor of the Syracuse *Herald* and city editor of the Syracuse *Journal*. In 1903 he became secretary to the Mayor of Syracuse and in 1905 secretary of the Syracuse Chamber of Commerce. After that he was Public Safety Commissioner in Syracuse and again secretary of the chamber. In 1911 he became an editor of the Syracuse *Journal* and in 1912 he did publicity work for the firm of Allen & Peck, Inc. One year later he became editor of *Aera*. Harlow Clark's interest in civic affairs never abated, and he was a frequent contributor to the New York *Times* and to other papers and to magazines on topics of city affairs speaking with the broad and humanitarian knowledge of them which his intimate contact with them at first hand had engendered.

W. E. Livingston

W. Eugene Livingston, secretary and treasurer of the Grand Rapids Railroad, Grand Rapids, Mich., died suddenly on April 17. He had gone to the company's amusement park at Ramona, Reed's Lake, on an inspection tour preparatory to the opening of the park, when he was stricken with heart failure, from which he had been ill some time.

Mr. Livingston was born in Grand Rapids on May 1, 1880. He started with the railroad there on Nov. 1, 1903, as a clerk in the storeroom. Later he was promoted to purchasing agent and a few years ago was elected secretary and treasurer. For three years he had been manager of Ramona Park, operated by the company and one of the leading amusement parks of the country.

Mr. Livingston was active in the civic progress of the city and was a leader in every movement for industrial or commercial advancement. He was past president of the Lions Club, active in the Association of Commerce and in Masonic circles.

Nelson Robinson

Nelson Robinson, a former member of the New York Stock Exchange and director of electric railways in Buffalo and Philadelphia, died in New York on March 27 after an operation. He was a widower, 77 years old.

For some years Mr. Robinson was interested in the International Railway of Buffalo. In 1922 he was elected a director of the Philadelphia Rapid Transit Company, in which he had been a strong supporter of the late Thomas E. Mitten.

Mr. Robinson was born in the Union Square section of New York City, a son of the late Nelson Robinson, who was a partner of Daniel Drew. The American founders of the family settled in Putnam County, N. Y., in Colonial days. After attending the Choales School at Newport, R. I., and the Sheffield Scientific School at Yale, Mr. Robinson entered Wall Street. He later became a member of the Exchange and a partner in Homans & Company, brokers. He retired from business about seven years ago.

Joseph R. Ellicott

Joseph R. Ellicott, for many years an official of the Westinghouse Air Brake Company, died of heart disease at his home at Ormond Beach, Fla., on April 16. It was in 1905 that he was appointed New York district manager of both the Westinghouse Traction Brake Company and the Westinghouse Air Brake Company. In these positions he continued until 1919, when he asked to be relieved of active duty. Since then he has served in a consulting capacity. For several years he had made his home in Florida. He was president of the American Electric Railway Association for several terms.

As H. H. Westinghouse, chairman of the Westinghouse Air Brake Company, said, Mr. Ellicott's death will be deeply regretted not only by his immediate associates but by his many friends in the railroad field. He was an able executive and a genial friend, and he played an important part in modern railroad development. Few men were more widely known or held in higher regard by the railroad officials and engineers of America.

Mr. Ellicott was born in Batavia, N. Y., in 1858. He was educated at the public schools of Grand Rapids, Mich. He started in busines with the First National Bank of Grand Rapids. In 1873 he entered railroading, becoming a fireman on the Michigan Central.

In 1877 he was employed in the claims department of the Chicago & North Western Railroad and later became traveling auditor, first for the St. Paul, Minneapolis & Omaha Railroad and then for the Chicago & North Western. He then became, successively, general manager of the Ajax Forge Company, Chicago; Eastern sales manager of the Griffin Wheel & Foundry Company in New York, and organizer and director of the General Agency Company, a railway supply company, New York.

In 1898 he was made general manager of the Standard Air Brake Company. In 1901 the company was taken over by the Standard Traction Brake Company, which was in turn controlled by the Westinghouse Air Brake Company, and Mr. Ellicott was made manager of this company, with headquarters in New York. The Westinghouse Traction Brake Company succeeded the Standard Company in 1903, with Mr. Ellicott retained as manager. From that post he was advanced in 1905 to district manager.

Mr. Ellicott is survived by a widow, two sons, Charles R. Ellicott and Joseph R. Ellicott, Jr., and a daughter.

W. I. Berryman

William I. Berryman, Union Trust Company official, died on April 13 at Pittsburgh, Pa. Mr. Berryman's other business interests in the last 35 years included J. W. Berryman & Sons, merchants, of Coal Centre, Pa.; presidency of the Pittsburgh & Charleroi Street Railway and of the West Side Street Railway, vice-presidency of Webster, Monessen, Bellvernon & Fayette City Street Railway; the Bank of Charleroi & Trust Company and the Union Trust Company of Clairton. He held directorships in the First National Bank of Finleyville, the Connellsville Courier Publishing Company, the Babcock Carrier Lumber Company and the Tilghman Island Club. He was born in August, 1865, and was graduated from California Normal School, taught school and then took a business course at Poughkeepsie, N. Y. He attended Waynesburg College, and later was admitted to the bar.

R. J. Higgins

Richard J. Higgins, connected with the legal department of the Kansas City Public Service Company, Kansas City, Mo., for many years and widely known throughout the country for his legal ability, died on April 1.

Mr. Higgins became connected with the legal department of the Kansas City Railways, predecessor of the present company, in 1916, as general solicitor. Later he was made general counsel, and remained in the latter position until the receivership in 1920. He then returned to the practice of law and was one of the attorneys representing the bondholders protective committee during the receivership. At the time of his death Mr. Higgins was employed as special counsel for Kansas City Public Service Company, in which capacity he was primarily engaged in the 10-cent fare case.

At the age of 25 years, Mr. Higgins was known as one of the youngest judges in the United States. He held that position for about a year when he was appointed city attorney for Kansas City, Kan., in which capacity he served three terms.

Mr. Higgins was born May 14, 1883, in Kansas City, Mo. He was graduated from the Kansas City School of Law in 1906, and in the ensuing years built up a practice which earned him the reputation of being one of the most able lawyers in the Middle West. He formerly was associated with James A. Reed, and participated with him in defending Henry Ford in the famous libel suit.

J. B. Terbell

Joseph Bodine Terbell, chairman of the board of directors of the American Brake Shoe & Foundry Company with which he had been associated for the last 30 years, died in New York on April 15.

Mr. Terbell was born at Corning, N. Y., Feb. 12, 1863. After he was graduated from Hamilton College in 1884 he at once went to work with the Fall Brook Railway, a small railroad near Corning which is now a part of the New York Central System. He was an officer of this road for thirteen years, until 1897, when he became president of the Corning Brake Shoe Company.

While occupying this position he helped bring about a merger with the American Brake Shoe & Foundry Company, in 1902, and assumed the vice-presidency of the consolidation. He was elected president in 1919, retiring ten years later to take the chairmanship of the board.

In addition to serving subsidiary corporations allied to the American Brake Shoe & Foundry Company, Mr. Terbell was a director of several others of national importance, including a number of banks.

G. L. Maltby

George L. Maltby, president and general manager of the Jamestown, Westfield & Northwestern Railroad, the Jamestown Street Railway, the Jamestown Motor Bus Transportation Company and the Chautauqua Lake Navigation Company, died on March 29 at a hospital in Jamestown, N. Y., following a brief illness.

Mr. Maltby planned and carried out an extensive reorganization of the transportation lines at Jamestown, effecting many economies in management and improving service. The Jamestown, Westfield & Northwestern Railroad was practically rebuilt during his administration and an extensive interline freight business developed. The Chautauqua Traction Company, paralleling the line of the Jamestown, Westfield & Northwestern Railroad, on the west side of Lake Chautauqua, was abandoned and service of the Chautauqua Lake Navigation Company was cut down to the operation of a ferry connecting Mayville, Point Chautauqua and Chautauqua. Service of the Jamestown Motor Bus Transportation Company was extended and several new lines added. On the lines of the Jamestown Street Railway one-man cars were placed in operation and many routes combined.

Mr. Maltby was born in Jamestown 47 years ago. Following his graduation from the local high school he became ticket agent for the New York Central Lines. Later he joined the local Jamestown lines and subsequently became general superintendent of the Jamestown, Westfield & Northwestern Railroad.

Following the death of Almet N. Broadhead, president of the various lines, in May, 1925, Mr. Maltby was elected general manager. When Homer M. Preston, president, died in 1928, he was appointed to the post of president.

James R. Pratt

James R. Pratt, who began his career as a conductor in Baltimore more than 35 years ago and rose to the position of vice-president and general manager of the United Railways & Electric Company, from which he retired in 1920, died there on April 22. More recently he had been president of the Maryland-Delaware Coast Railroad. He was 67 years old.

When Mr. Pratt withdrew from the company at Baltimore he went into business for himself. The record of his rise in esteem in the eyes of civic Baltimore until he commanded both public commendation and editorial attention reads like a page from Horatio Alger. James Pratt became a master at his work. From the post of trainman he went into the claim department. But he wasn't destined to stop there. Not James R. Pratt. He worked hard and he studied diligently. And his efforts were crowned by his admission to the bar. He made a name for himself as a practitioner, and won renown as a factor in the affairs of the American Bar Association and for his work in association affairs in this industry.

It is eleven years since Mr. Pratt participated actively in the affairs of electric railways, but the industry has always considered him its own, for if this industry afforded Mr. Pratt his opportunity, Mr. Pratt in turn afforded this industry its opportunity—to be proud of him. All of which it was.

◆

Charles F. Donnelly, formerly superintendent of the Northern division of the Key System Transit, Oakland, now the East Bay Street Railway, is dead. After finishing his schooling at the old Lincoln School in San Francisco, Mr. Donnelly entered the service of the United Railways, San Francisco, as a motorman. He later was appointed inspector. In 1906 Mr. Donnelly went to Richmond as assistant superintendent of the East Shore & Suburban Railways, a forerunner of the present company. In 1913 he was promoted to superintendent, a position he held until his recent illness.

◆

Benjamin I. Spock, general counsel for the New York, New Haven & Hartford Railroad and of the Connecticut Company, New Haven, Conn., died in Bermuda on April 22. Mr. Spock had been suffering from a heart ailment for two years. A week ago he went to Bermuda on the advice of physicians. He was born in New Haven and was graduated from Yale in 1897. He started with the New Haven Railroad in 1903.

◆

William J. Tylee, receiver for the Penn Yan & Lake Shore Railway, which discontinued operations two years ago, died recently at his home in Penn Yan, N. Y., following a brief illness.

INDUSTRY MARKET AND TRADE NEWS

B.-M. T. recently tested this Diesel engine bus in a week of experimental operation

Diesel Engine Buses Under Tests by Electric Railways

Increased interest is being shown by electric railways in the Diesel engine as a propulsion power plant for buses. Fuel economy has always been a strong point in favor of the Diesel engine, but the lack of thorough and extended tests has retarded its adoption by electric railways in this country. However, during the past year several railways have made extended tests of buses driven by Diesel engines with generally satisfactory results. In all the tests substantial fuel economy was obtained.

The Public Service Co-ordinated Transport purchased a Mercedes-Benz Diesel truck engine in August, 1929. This engine had a 105-mm. bore, 165-mm. stroke, and developed 70 hp. at the governed speed of 1,300 r.p.m. It weighed about 1,400 lb. It was installed in a standard gasoline-electric 30-passenger bus, and was operated in regular service in Newark throughout the winter of 1929-1930. In March, 1930, an experimental Diesel engine, built especially for bus operation, was received from Germany, having a 100-mm. bore, 150-mm. stroke, and developed 75 hp. at a speed of 1,600 r.p.m. After it had been in service for a time, this engine was returned to the manufacturer in Germany who sent back a third model incorporating several improvements found desirable during the test operation by Public Service. The third model has been operating in city service since October, 1930, with satisfactory results.

Capitol District Transportation Company, Albany, N. Y., purchased a Mercedes-Benz Diesel engine with an 85-hp. rating at 1,600 r.p.m., and weighing 1,580 lb. It installed this engine in a Mack bus, Model AL, with electric drive, and operated the vehicle in daily service for 10,000 miles as a test. Accurate performance data were kept of this engine, and at the end of the test comparisons with other types of buses were very favorable in the matter of fuel economy.

The Brooklyn-Manhattan Transit Corporation recently ran a test operation for a week with a Diesel engine bus, the first complete Diesel engine bus imported from Germany. The bus was built by Mercedes-Benz, having a 72-hp. Diesel engine weighing 1,400 lb. The body was of all-steel construction, having an over-all length of 30 ft., and a seating capacity of 30 passengers. The results of this test were said to be satisfactory.

These imported Diesel engines are built by the Daimler-Benz Company, the parent company of the Mercedes-Benz Company, which has had considerable experience in the production of stationary Diesel engines for many years at Mannheim. Three important patents cover the principles of design, which gave the original impetus to the development of the compressor Diesel engine. These include the adoption of a precombustion chamber before the main combustion chamber, the design of the burner and the particular formation of the passage between precombustion chamber and cylinder.

In the precombustion chamber process, the fuel is not injected directly into the part of the cylinder swept by the piston but into a precombustion chamber where it undergoes partial combustion. The extra pressure thus generated in the precombustion chamber drives the fuel-air mixture through a special burner into the combustion chamber proper, where it is mixed with the air. The compression pressure is about 500 lb. per sq.in., the combustion pressure about 590 lb. per sq.in. The precombustion chamber replaces the compressor since it fulfills the requirements of introducing the fuel into the actual combustion chamber with perfect atomization of the fuel and intimate admixture with the combustion air.

The introduction of the fuel into the actual combustion chamber is effected by means of an atomizer situated between this and the precombustion chamber. This burner is fitted in such a way that only its lower face is in contact with the gases of combustion and any heating effect on the cooled walls is almost entirely precluded. In this way a rapid destruction of the body of the attachment, which might be caused by high passage velocity of the hot gases, is prevented.

300 Cars To Be Ordered for New York Subway

Before the end of the summer the Board of Transportation will place a contract for 300 more steel cars for use on the new subway lines, John H. Delaney, chairman, announced. The new cars will augment the 300 already delivered. Their cost is expected to be about $9,000,000, the price paid for the first 300. Mr. Delaney estimated that about 2,000 cars would be required for the new city lines mapped out in the Board of Transportation's first stage of new rapid transit construction.

Of the first 300 cars, nearly all have been tested in trial runs in the 207th Street yards. Two trains of ten cars each will be tested soon in service conditions on sections of the B.-M.T. system to check the efficiency of the four-door construction in loading and discharging passengers.

◆

Chicago Will Increase Trolley Bus Fleet

Twenty-nine more trolley buses were ordered on March 28 by the Chicago Surface Lines for use in extending and supplementing its present system on the Northwest section of the city. A portion of these vehicles will be used to increase service on the heavy Central Avenue line. The remaining will be operated along new trolley bus routes. The trolley buses will replace gasoline buses along Belmont Avenue, and the other line will be the first step in a general program of establishing feeder service to rapid transit terminals. Four of the trolley buses have been in test service in Chicago.

Eleven of the new trolley buses were ordered from J. G. Brill Company, ten from the Twin Coach Corporation, six from the Cincinnati Car Company and two from the American Car & Foundry Motors Company. These orders will increase the total of trolley buses in Chicago to 114.

◆

British Railways Order Mercury Arc Rectifiers

The British Thomson-Houston Company, Limited, of Rugby, has obtained repeat orders from the London Electric Railway Company for the following mercury arc rectifiers: Seventeen of 1,500 kw. each and five of 2,000 kw. each. These rectifiers, which are of British design and manufacture, will be installed in nine substations, for which the equipment will include, in addition to the rectifiers, over 100 air blast transformers, 120 high-speed circuit breakers, and 60 heavy-duty oil circuit breakers. The rectifiers will be provided with automatic control gear for remote control. This is the largest order for mercury arc rectifiers ever placed in England.

The company also has in hand the manufacture of two 1,200-kw. mercury arc rectifiers for the London, Midland & Scottish Railway, Barking-Upminster electrification scheme, while a rectifier will shortly go into service on the Manchester-Altrincham Railway, the electrification of which is nearing completion.

Brown Boveri Receives German Rail Contract

Electrification of the Stuttgart-Augsburg Railway line in southern Germany was decided upon recently by the Reichsbahn. The line is a continuation of that of the Augsburg-Munich, which is already electrified. Brown Boveri, Siemens-Schuckert, AEG and Bergman will divide the contract involving an expenditure estimated at 50,000,000 reichsmarks.

No immediate financing by the Reichbahn will be necessary as a Swedish, Swiss and Dutch syndicate, headed by Schweizerische Kreditanstalt, has agreed to grant 7 per cent credit for the 1931 and 1932 work. The electrical manufacturers are guarantors to this loan. It is estimated that 10,000 Germans will receive employment in the electrification work.

Road Building Speeded Up by New Du Pont Method

Certain phases of road building have been revolutionized by a new method developed by Du Pont explosives experts and highway engineers and recently announced. It is claimed that the new method frequently reduces the settling of fills to one-tenth the time formerly required.

Quantities of dynamite, in some cases amounting to 1,200 lb., are placed in the soft mud and a fill of earth is piled above it, sometimes the mound being as high as 30 ft. and containing 6,000 cu.yd. of earth. The explosive is detonated, the soft mire blown out and the fill settles down to hard ground, leaving a firm, solid foundation for the concrete or other top material. The method is known as "accelerated fill settlement work" and it has greatly speeded up road building in those places where soft mire conditions have been encountered.

Pennsylvania Buys $7,500,000 of Steel

Contracts for approximately $7,500,000 of structural steel and accessories were recently placed by the Pennsylvania Railroad. The material will be used for the railroad's $175,000,000 improvement program, which includes the electrification of its lines between New York and Washington, D. C., and terminal improvements at Newark, N. J., and Philadelphia.

The structural steel contracts totaled 100,900 tons and were awarded to eight different companies. The following steel companies share the huge order: McClintic-Marshall Steel Corporation, subsidiary of the Bethlehem Steel Corporation, 34,000 tons; American Bridge Company, a subsidiary of the United States Steel Corporation, 26,000 tons; Shoemaker Bridge Company, 14,000 tons; Ingalls Iron Works Company, 13,000; Mount Vernon Bridge Company, 4,300 tons; Fort Pitt Bridge Works, 4,000 tons; Lehigh Structural Steel Company, 4,000 tons; and Phoenix Bridge Company, 1,600 tons. Fabrication of the steel was started immediately after the award of the contracts.

Nearly one-half of the steel will be used in the electrification of the lines between New York and Washington. A total of 47,000 tons of fabricated steel for poles, crossarms, beams and braces will be used for the overhead lines, signal bridges and substations were switching equipment, and power transformers are located. The work of erecting the steel for the power lines between the Sunnyside yards in Long Island and Manhattan Transfer in Newark has been practically completed.

Construction to be undertaken immediately on the new passenger terminal in Philadelphia will require 18,000 tons of the steel orders. Preliminary ground work on the Philadelphia station is already progressing rapidly, following the recent award of a $1,500,000 contract for excavation and foundation.

Waste Material Association to Make Scrap Copper Survey

The National Association of Waste Material Dealers is undertaking a survey of the copper and brass scrap industries, working in co-operation with the Copper and Brass Research Association, the Nonferrous Ingot Metal Institute and the American Association of Engineers. Provided the present experiment justifies such action, it is planned to make a canvass annually and to cover all domestic geographic sources of scrap copper and brass reduction points.

For many years the Bureau of Mines of the Department of Commerce has issued a yearly summary of the amount of copper, zinc, tin, lead, antimony, aluminum and nickel made available to the trade, and the technology of the methods used in their recovery.

U. S. Rubber Enters Brake Lining Field

United States Rubber Company has placed on the market a complete line of automobile and industrial brake lining products. The distinguishing feature of the new line is that latex, the liquid form in which rubber is obtained from the tree, is used as the bonding material. Laboratory tests are understood to have indicated certain advantages for brake lining manufactured by this process. The products will carry the trade name "Royal Master."

The new products have been developed by the fiber products department, but sales will be handled by a new brake lining division of the tire department of the company.

London Orders 335 Cars

In connection with the extensions now in progress of the Great Northern, Piccadilly & Brompton, the London County Council has ordered 145 motor cars and 130 trail cars. In addition to this order, the Council has decided to order 60 cars of similar type for operation on hilly routes, which will involve an estimated expenditure of £174,000. These cars will replace the old cars which cannot be reconditioned. The added equipment will meet all traffic demands which have been estimated for the future.

Omaha Burns Old Cars

Thirty-five street cars, some in use since 1898, belonging to the Omaha & Council Bluffs Street Railway Company, are being burned. These cars represent an original value of approximately $250,000. About $20,000 will be salvaged from the old cars.

Some of the oldest cars have been used only as emergency cars of late, but others have been in regular use up until last winter. The old cars are being replaced by steel rebuilt cars, eight of which have gone into service since Jan. 1.

Wind Tunnel Tests for High-Speed Car Designs

One drop of falling water is showing engineers and scientists how to revolutionize the shape of trains, locomotives, interurban cars and other high-speed vehicles.

That drop of water helped them to work out the present designs for Zeppelins, airplane wings, and racing automobiles. Now the same principles are being applied to train design.

Demands for higher speed have been growing more and more insistent. The great possibilities of applying Acrodynamics to streamline design of trains and interurban cars is now realized.

More than one year ago Westinghouse Electric & Manufacturing Company built a wind tunnel for testing models of present type trains as well as those of the streamline pattern. Investigations of wind resistance revealed that a falling drop of water assumes a shape offering the least resistance when descending through air. Air resistance tests of high-speed trains and automobiles indicated that total train resistance could be reduced one-half and wind resistance to one-third for certain types of rail equipment at high speeds.

In a series of tests with models of present type and streamline cars in winds of varying velocities, up to 80 m.p.h. some startling conclusions were worked out.

For a heavy locomotive and two heavy coaches, streamline design saves 13 per cent of the required total horsepower for a speed of 35 m.p.h. and 32 per cent of the total horsepower for a speed of 75 m.p.h.

It requires 286 horsepower to drive the present type of light interurban car at 80 m.p.h. Tests made in the Westinghouse wind tunnel indicated that the same type of car in the streamline design can be driven at 80 m.p.h. with only 140 horsepower, thus saving 146 horsepower. At 35 m.p.h., streamlining will save 30 per cent of the horsepower required for the present type of car.

It is evident that streamlining is not as important for the slower speeds or for heavy equipment as it is for high speeds and light equipment. Dr. Tietjens, who conducted the tests, concludes that streamlining will be worth while for medium and high-speed, light interurban cars and for heavy high-speed trains.

Packing of Overhead Line Material to Be Discussed

A general conference of manufacturers, distributors and users of overhead electric railway materials will be held, under the auspices of the division of simplified practice of the Bureau of Standards, in the board of directors room, Chamber of Commerce Building, Pittsburgh, Pa., at 10 a.m., daylight saving time, on Thursday, May 7, 1931, to consider the simplification of packaging these units.

The American Electric Railway Association, through its committee on unit piling and standard packages, has been studying the possibilities and advantages of standard packages for this class of material for some time, and has submitted a tentative recommendation which will be used as a basis for discussion. The results of these studies indicate that the simplification of the number of units being packed in each container or bundle should prove helpful to manufacturers, distributors, and the electric railway companies, as consumers, and that much avoidable waste will be eliminated in this field.

Conspectus of Indexes for April, 1931

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Apr., 1931 7.81	Mar., 1931 7.80	Apr., 1930 7.71	Apr., 1931 7.81	Apr., 1926 7.35
Electric Railway Materials* 1913 = 100	Apr., 1931 120	Mar., 1931 124	Apr., 1930 140	Dec., 1926 159	Apr., 1931 120
Electric Railway Wages* 1913 = 100	Apr., 1931 233.2	Mar., 1931 231.9	Apr., 1930 231.7	Apr., 1931 233.2	Apr., 1926 224.7
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Apr., 1931 186	Mar., 1931 187	Apr., 1930 203	Nov., 1928 206	Apr., 1931 186
General Construction Cost Eng'g News-Record 1913 = 100	Apr., 1931 191.6	Mar., 1931 194.5	Apr., 1930 207.1	Jan., 1927 211.5	Apr., 1931 191.6
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Mar., 1931 74.5	Feb., 1931 75.5	Mar., 1930 90.8	May 1926 100.5	Mar., 1931 74.5
Wholesale Commodities Bradstreet 1913 = 9.21	Apr., 1931 9.23	Mar., 1931 9.17	Apr., 1930 11.18	Jan., 1928 13.57	Mar., 1931 9.17
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Mar., 1931 126.4	Feb., 1931 127.0	Mar., 1930 150.1	Apr., 1926 162.4	Mar., 1931 126.4
Cost of Living Nat. Ind. Conf. Bd. 1923 = 100	Feb., 1931 89.6	Jan., 1931 91.1	Feb., 1930 98.5	Feb., 1926 106.2	Feb., 1931 89.6
General Business The Business Week Normal = 100	Apr. 11, 1931 78.6	Mar. 14, 1931 81.4	Ap. 12, 1930 96.5	Oct. 6, 1928 117.6	Jan. 31, 1931 77.0
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Mar., 1931 108.2	Feb., 1931 110.3	Mar., 1930 120.3	Feb., 1929 140.4	Jan., 1931 97.6
Bank Clearings Outside N. Y. City 1926 = 100	Mar., 1931 71.5	Feb., 1931 69.8	Mar., 1930 94.3	Oct., 1929 111.8	Feb., 1931 69.8

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Rail Prices Under Scrutiny

Investigation by the Department of Justice will reveal that the prices of steel rails have been fixed by fiat for the past 30 years. To the extent that the purchase of rails is infected by the contagion of reciprocal buying, the matter is subject to scrutiny by the Interstate Commerce Commission, to which Senator Couzens, chairman of the Senate interstate commerce committee, has submitted a request for an investigation, but the Department of Justice is the only agency that is empowered to act under the anti-trust laws with regard to the uniformity in rail prices, which have stood at $43 per ton for the last nine years, having been boosted from $40 on Oct. 1, 1922. The prices bid vary only to the extent that specifications call for delivery of rails which depart from basic standards and, in ordinary practice, the railroads divide their orders among several steel companies.

Cement Output Capacity Put at 261,000,000 Barrels

The production capacity of the Portland cement industry in the United States is estimated to exceed 261,630,000 barrels, according to Frank H. Crehore & Company, who have completed an analysis of the industry. In 1930 the Portland cement plants produced 160,905,000 barrels of cement, or approximately 61 per cent of the capacity of present equipment. This ratio is seen as placing the industry in a favorable position to meet expanding demands. At the present time there are 172 plants distributed at strategic points in 36 states, Pennsylvania having the most with 29 plants. There are thirteen major units in the Portland cement industry.

◆

Zinc Hits Lowest Since 1902

Price of common zinc metal, known as prime Western slab zinc, declined during April to the lowest price since 1902, 3.90 cents per pound, East St. Louis, or 4.25 cents, New York. The drop followed the issuance of zinc statistics for March by the American Zinc Institute. Though the trend was shown to be favorable the net change was evidently too small to be considered satisfactory. In 1902 the price of zinc dipped to 4.10 cents per pound, New York. The lowest price ever recorded was 3.10 cents, New York, in 1895, while the highest was 27½ cents per pound in 1915, during the war when scarcity of material was general. Three or four times during the past year zinc has dropped to 3.95 cents, East St. Louis, or 4.30 cents, New York. On every occasion that figure proved to be the bottom of the market.

◆

Four Million Pounds of Sheet Aluminum Ordered

An order for 4,000,000 lb. of sheet aluminum has been received at the Alcoa plant in Tennessee, the new alloy plant of the Aluminum Company. This is a strong indication that the new plant is rapidly gaining capacity in an operating schedule and that it will soon be able to maintain a full-time operating schedule. It was also announced that heavy rains had almost completely restored the supply of water at the various dams of the plant of the Aluminum Company.

Electric Railway Material Prices April 24, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	9.50
Lead. cents per lb.	4.50
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	3.90
Tin, Straits, cents per lb.	24.85
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	33.75
General service	29.00

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	8.00–12.00
Colored	7.00–10.00

Wire—New York

Bare copper wire, cents per lb.	11.50
Rubber-covered wire, No. 14, per 1,000 ft.	$4.25
Weatherproof wire base, cents per lb.	12.75

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	9.6
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), cents per gal.	55.00
Putty, 100 lb. tins, cents per lb.	5.50

Scrap Metal—New York

Heavy copper, cents per lb.	7.25
Light copper, cents per lb.	6.25
Heavy brass, cents per lb.	4.25
Zinc, cents per lb.	2.12
Lead, heavy, cents per lb.	3.50
Mixed babbit, cents per lb.	3.50
Battery lead plates, cents per lb.	1.50

Old Material—Chicago

Steel car axles, net ton	$13.00
Cast iron car wheels, gross ton	9.75
Steel car wheels, gross ton	12.75
Leaf springs, cut apart, gross ton	12.50
Angle bars, gross ton	11.25
Brake shoes, net ton	8.00
Steel rails (short), gross ton	12.75
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	4.75

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{9}{16}$-in. and larger, per 100 lb.	2.70
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	1.35

Hardware—Pittsburgh

Wire nails, per keg	$1.95
Sheet iron (24 gage), cents per lb.	2.25
Sheet iron, galvanized (24 gage), cents per lb.	2.85
Auto body sheets (20 gage), cents per lb.	3.15

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	1.18
Kansas screenings, Kansas City	1.75
Big Seam, Ala., mine run	1.70
Smokeless mine run, Chicago	1.80

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.35
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt, in pkg. N. Y., f.o.b. ref., per ton	16.00

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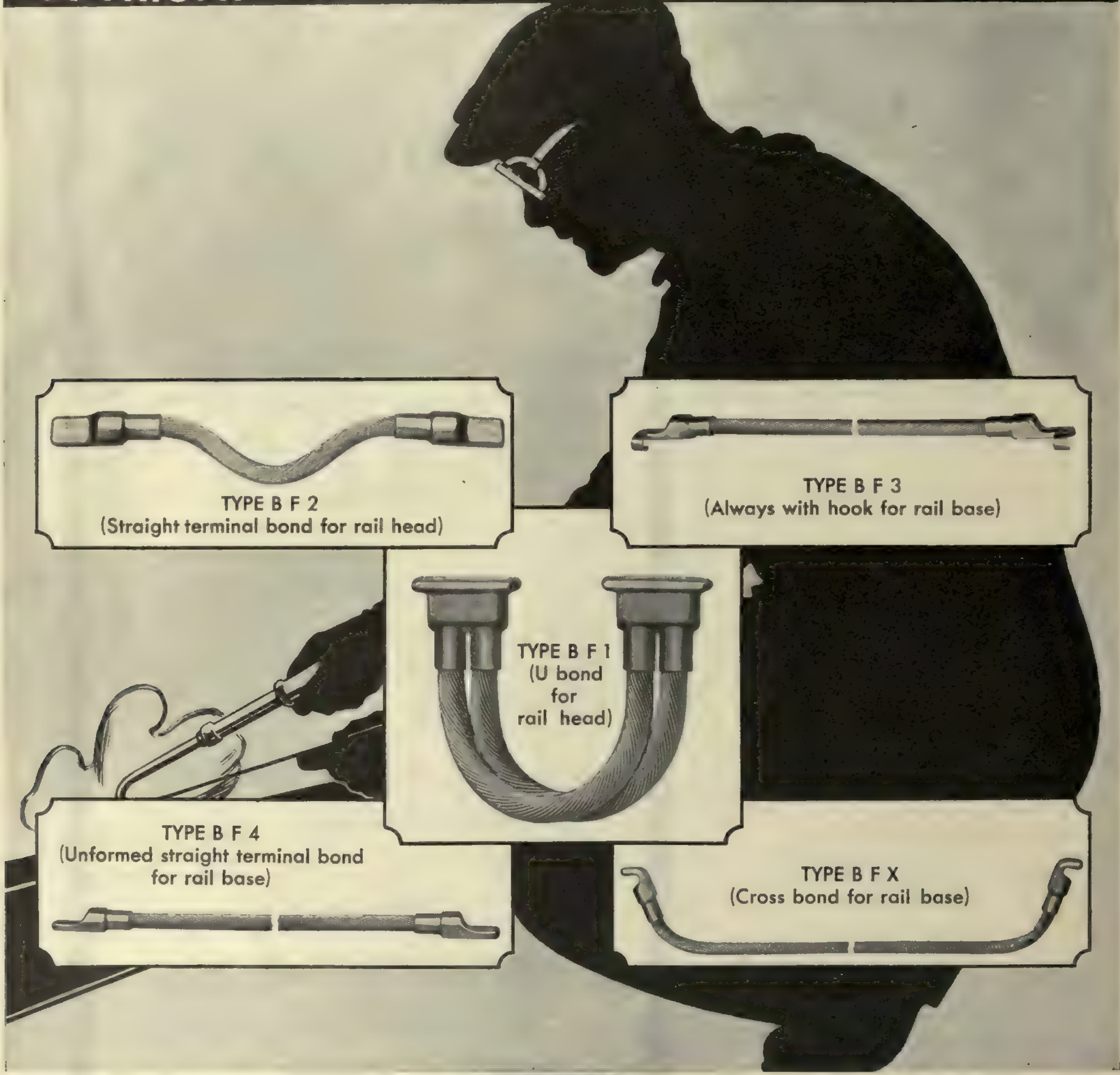

TYPE B F 2
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TYPE B F 3
(Always with hook for rail base)

TYPE B F 1
(U bond for rail head)

TYPE B F 4
(Unformed straight terminal bond for rail base)

TYPE B F X
(Cross bond for rail base)

1831 COMMEMORATING 100 YEARS PROGRESS IN WIRE MAKING 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION And All Principal Cities
Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

4,000,000

For 4 years the Pittsburgh Motor Coach Company (Byllesby Engineering and Management Corp., Engineers-Managers) has equipped its buses with Goodyear Tires

BUS MILES

ON PITTSBURGH STREETS

Pittsburgh is a typical city for motorcoach operation. Its choked downtown streets bear heavy traffic, necessitating frequent, quick stops. On broader boulevards in the residential sections, traffic stretches out, speeds up. And Pittsburgh has many hills—stiff ones to go up or down.

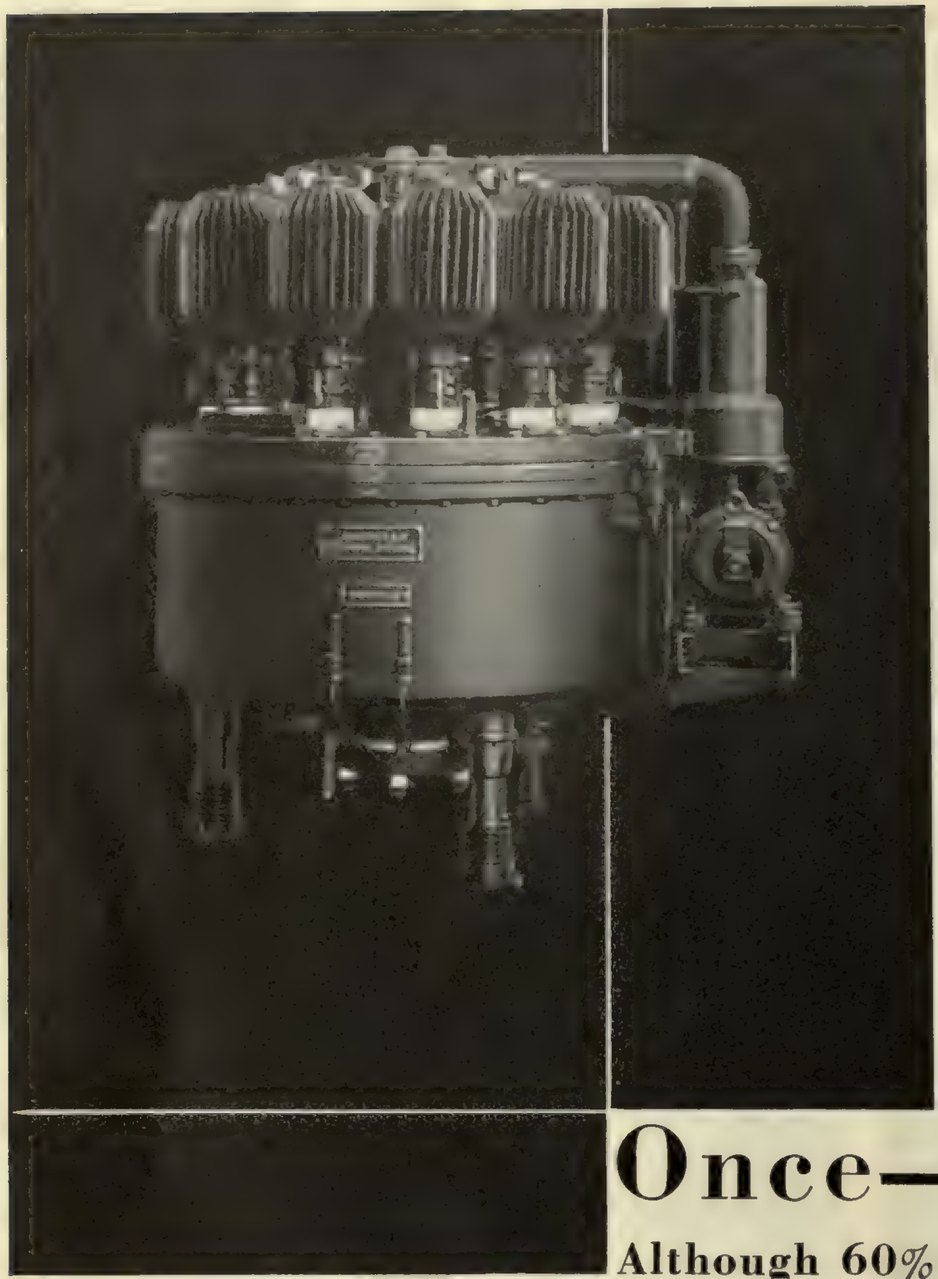
The 103 buses of the Pittsburgh Motor Coach Company have established a reputation for swift, comfortable, and dependable passenger service. Last year, this fleet traveled approximately 4,000,000 miles, completing its fourth year on Goodyear tires.

Goodyear Bus Balloons qualify here on superior performance, just as they do in hundreds of other cities and towns—in tight city traffic and on long, fast interstate hauls.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS



Mercury Arc Power Rectifier for 600 volt D.C. service

Once—*always*

Although 60% of the orders for A.B.B. rectifiers in 1930 were from new users, over 72% of the capacity in K.W. was "repeat business."

New orders show confidence; repeat orders indicate satisfaction.

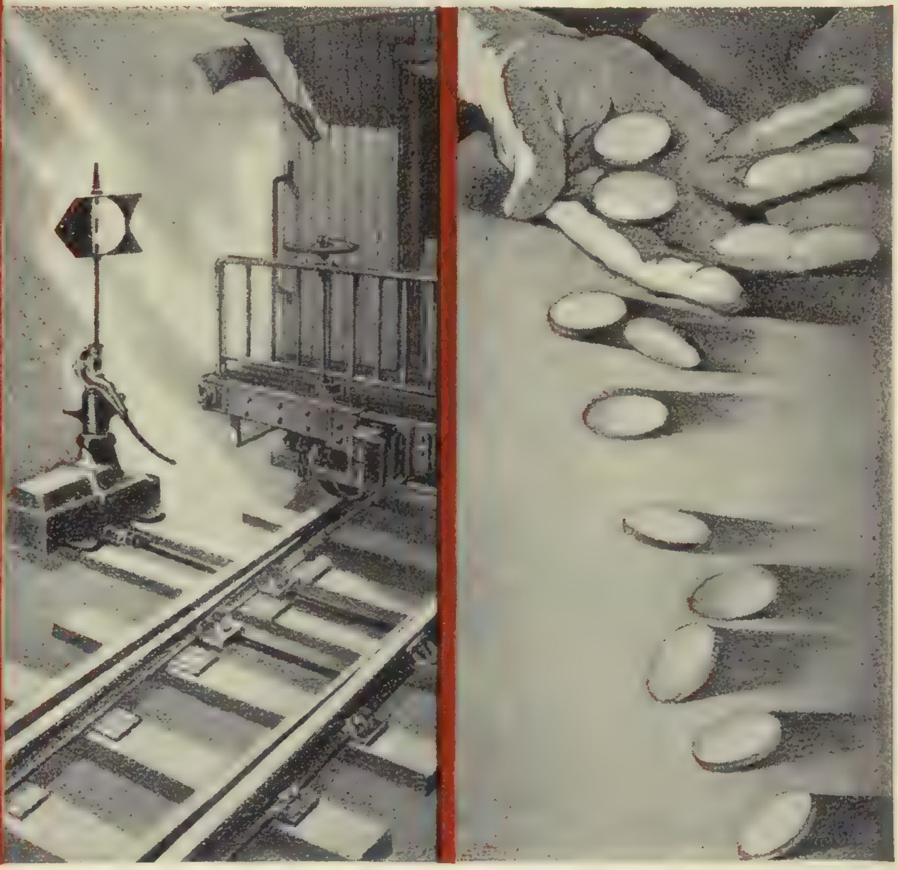
ABB

AMERICAN BROWN BOVERI CO., INC.
CAMDEN, N. J.

Pioneers in Mercury Arc Power Rectifiers

AMERICAN BROWN BOVERI

STOP WASTE



Railroad earnings have been cut. Net profit has been lowered, in some cases wiped out. Such a condition calls for strict attention to expenditures from which the annual return on investment is considerable. All waste must be stopped at once.

The cost of starting and stopping a car or train is small. But this sum multiplied by the number of operating cars and their stops per year adds a tremendous sum to the annual operating overhead. With rigid switch stands at the ends of double track or passing siding, cars must stop and start twice for switch operations. The 3-in-1 Switch Stand, operating automatically, eliminates these stops with safety. Many steam railroads have found that the 3-in-1 will pay for itself in less than ten days. To eliminate waste motion . . . to save both time and money, adopt the 3-in-1 Switch Stand.

***A Simple Source of Dividends*:** A double-coil spring returning switch points after trailing train has passed; an oil buffer retarding return between successive pairs of wheels; and a rigid throw for hand operation are the mechanisms that eliminate stops and pay dividends. Write for complete printed information.

RACOR
TRADE MARK

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works Limited . . . . Niagara Falls, Ontario

General Offices—230 Park Avenue, New York

Sales Offices at Works and McCormick Building, Chicago Midland Bank Building, Cleveland, Ohio
Metropolitan Bank Building, Washington Builders Exchange Building, St. Paul
Union National Bank Building, Houston, Texas

Nine Racor Works: Hillburn, N. Y. Niagara Falls, N. Y. Chicago, Ill. East St. Louis, Ill.
Superior, Wis. Pueblo, Col. Los Angeles, Cal. Seattle, Wash. Niagara Falls, Ont.

When you need STEEL

INSEPARABLY linked with the development of Steel is the name "Carnegie." For nearly three-quarters of a century, Carnegie Steel Company has engaged in the manufacture of Steel—experimenting, learning, serving. The knowledge accumulated during this time, and the mechanical, metallurgical and engineering resources of this company are yours to summon. A dependable source of supply plays no small part in the success of a product or of an enterprise.

Wrought Steel Wheels
Forged Steel Axles
Standard Rails . Steel Cross Ties
Plates . Floor Plate
C B Sections . Structural Mill Products
Bar Mill Products
Stainless and Heat Resisting Steels

◆

CARNEGIE STEEL COMPANY · PITTSBURGH

Subsidiary of United States Steel Corporation

138

A LOCOMOTIVE BUILDER WHO

..changed his finish specification
..got a better product, and
..saved 31 cents a nut

THE NUTS used in the construction of a locomotive cost only a minor fraction of the total value of the materials needed, but they have an importance which, relatively, exceeds their cost. They must have strength, accuracy, and a good finish. For years R B & W EMPIRE Nuts have been standard on many locomotives.

The cost of these large nuts is secondary to their quality, but even in an item like this a saving is appreciated, as a recent experience proved. We submitted a regular semi-finished EMPIRE Nut, taken from stock, to a locomotive builder who had been buying a full-finished nut from another source.

After the locomotive builder had given us his initial order for semi-finished nuts, he wrote us that they had a better appearance than the full-finished nuts he had formerly purchased, and for which he had been paying a considerably higher price. His average saving, using R B & W Semi-Finished Nuts, was 31 cents a nut.

Eighty-six years of careful craftsmanship and constant progress in manufacturing methods in the R B & W plants result in high quality products made in large quantities to meet every need of American industry. An R B & W sales representative will be glad to discuss your bolt and nut requirements with you, without obligation.

BOURKE WHITE PHOTO

● *All R B & W products are carefully inspected before shipment*

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N. Y. ROCK FALLS, ILL.
CORAOPOLIS, PA.

Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

TULC
is guaranteed to

1. Reduce the Number of your Hot Bearings.
2. Reduce your Bearing Cost.
3. Save in the Cost of your Maintenance.
4. Lengthen Your Oiling Periods.

TULC will do these things on your property—will give you these lubrication savings that it is daily giving to many leading properties.

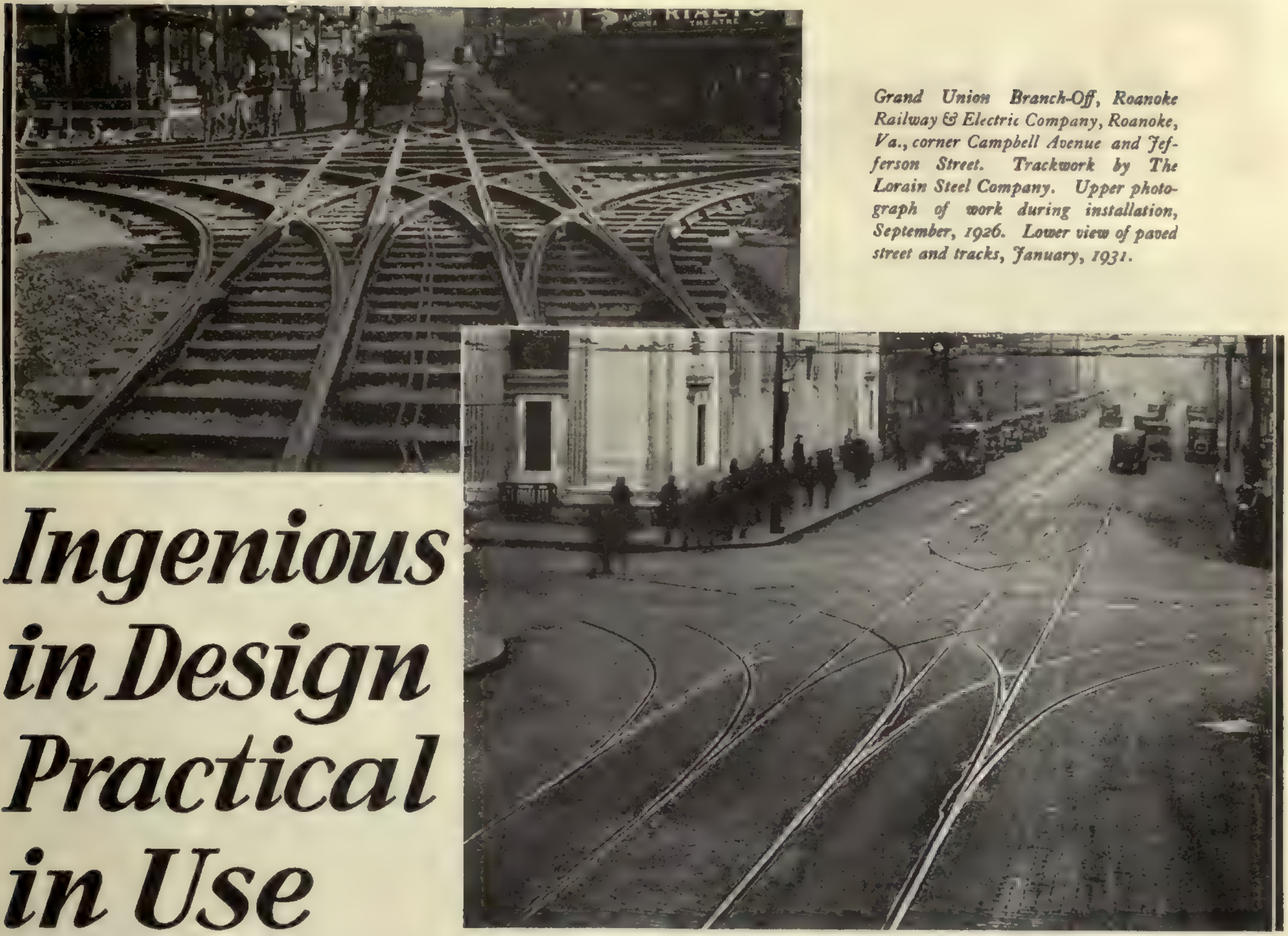
TULC is made for lubrication of electric railway equipment—for your needs. It stays put—does not run or drip off—does a real job of lubricating.

Under all conditions TULC insures faultless lubrication—with savings important enough to merit your investigation.

Arrange for a test of TULC—there is no obligation.

The
UNIVERSAL LUBRICATING CO.
CLEVELAND, OHIO

TULC
A
LUBRICANT



Grand Union Branch-Off, Roanoke Railway & Electric Company, Roanoke, Va., corner Campbell Avenue and Jefferson Street. Trackwork by The Lorain Steel Company. Upper photograph of work during installation, September, 1926. Lower view of paved street and tracks, January, 1931.

Ingenious in Design Practical in Use

LORAIN SPECIAL TRACKWORK

FROM the simplest to the most complicated requirements of urban, suburban, or interurban trackwork, Lorain has always kept pace with changing demands. Lorain leadership in this field, established a generation ago, was never more definite than now.

The actual and anticipated nature of street construction, traffic regulations, weight and character of rolling stock, speed, volume, and complexity of movement, are all reflected in the designs and recommendations of Lorain engineers for the most advanced electric railway projects.

The Grand-Union Branch-Off here shown was constructed by The Lorain Steel Company in 1926 for the Roanoke Railway & Electric Co., Roanoke, Va. All switches, mates, frogs, and crossings are of solid manganese steel. The tongue switches are of Lorain Tadpole Type. The closure rails are of open-hearth steel. The equipment throughout is of American Railway Engineering Association Standard 7-inch guard rail—Lorain Section 140-468—top of guard level with head, within the limits of the street intersections. The layout is built to an angle of 90 degrees, each of the quadrants being symmetrical.

This is a quite typical example of Lorain Trackwork. Five years of constant use have been sufficient to prove it trouble-free, practical, and satisfactory.

Correspondence regarding any problem of trackwork is invited.

THE LORAIN STEEL COMPANY, Johnstown, Pa.

Subsidiary of United States Steel Corporation

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

LORAIN SALES OFFICES— Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

PERFORMANCE

THAT COMPELS RECOGNITION

Actual service has proved this performance to the entire satisfaction of the operator.

STREET CAR Seats of deep spring construction provide for 21 passengers, while the two large loading wells and the 22-inch aisle (measured at seat cushions) accommodate upwards of 40 standees in comfort. Vacuum-operated entrance and exit doors are 24 inches in clear—assurance of easy, safe and rapid passenger circulation.

PARLOR COACH Seats are provided for 21-25 passengers. All except auxiliary and rear seats are of the reclining type with three-position adjustment and arm rests on both aisle and window sides. Interior baggage lofts are commodious and unusually sturdy. A distinctive modernistic motif has been achieved in the design of such interior appointments as reading lights, mirrors, window pillars, baggage lofts, etc. Passengers are assured exceptional comfort, clear vision and safety.

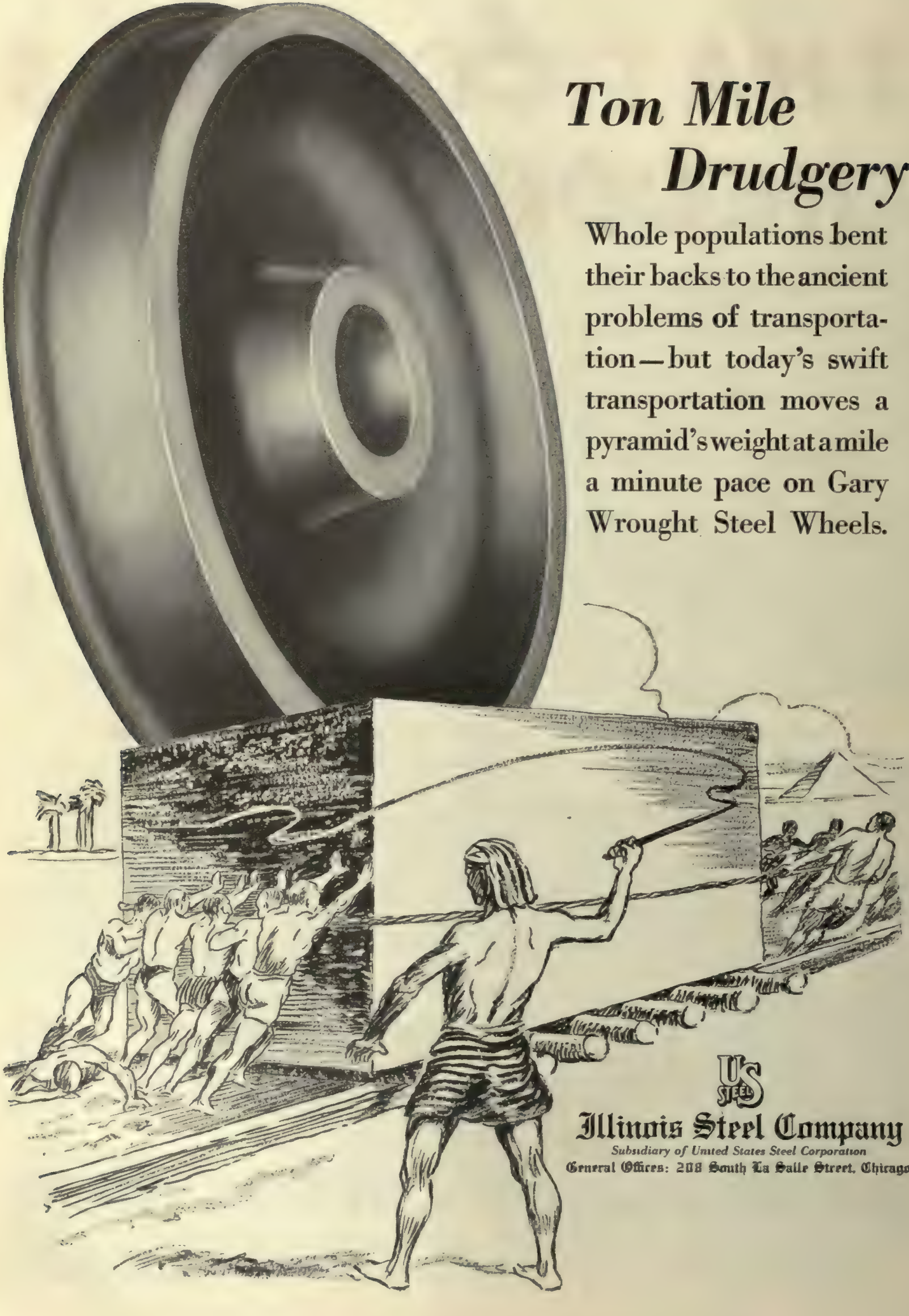
CHASSIS FEATURES 120-horsepower 8-cylinder engine . . . Heavy-duty 4-speed transmission . . . 172-inch wheelbase . . . Demountable power plant . . . Full-floating, worm-drive rear axle . . . 10-inch double-drop frame . . . Short turning radius, 27 feet . . . 4-wheel internal hydraulic brakes with booster . . . Designed throughout for motor coach service.

FARGO
BUILT BY CHRYSLER MOTORS

FARGO MOTOR CORPORATION

DETROIT, MICHIGAN

DIVISION OF CHRYSLER CORPORATION



Ton Mile Drudgery

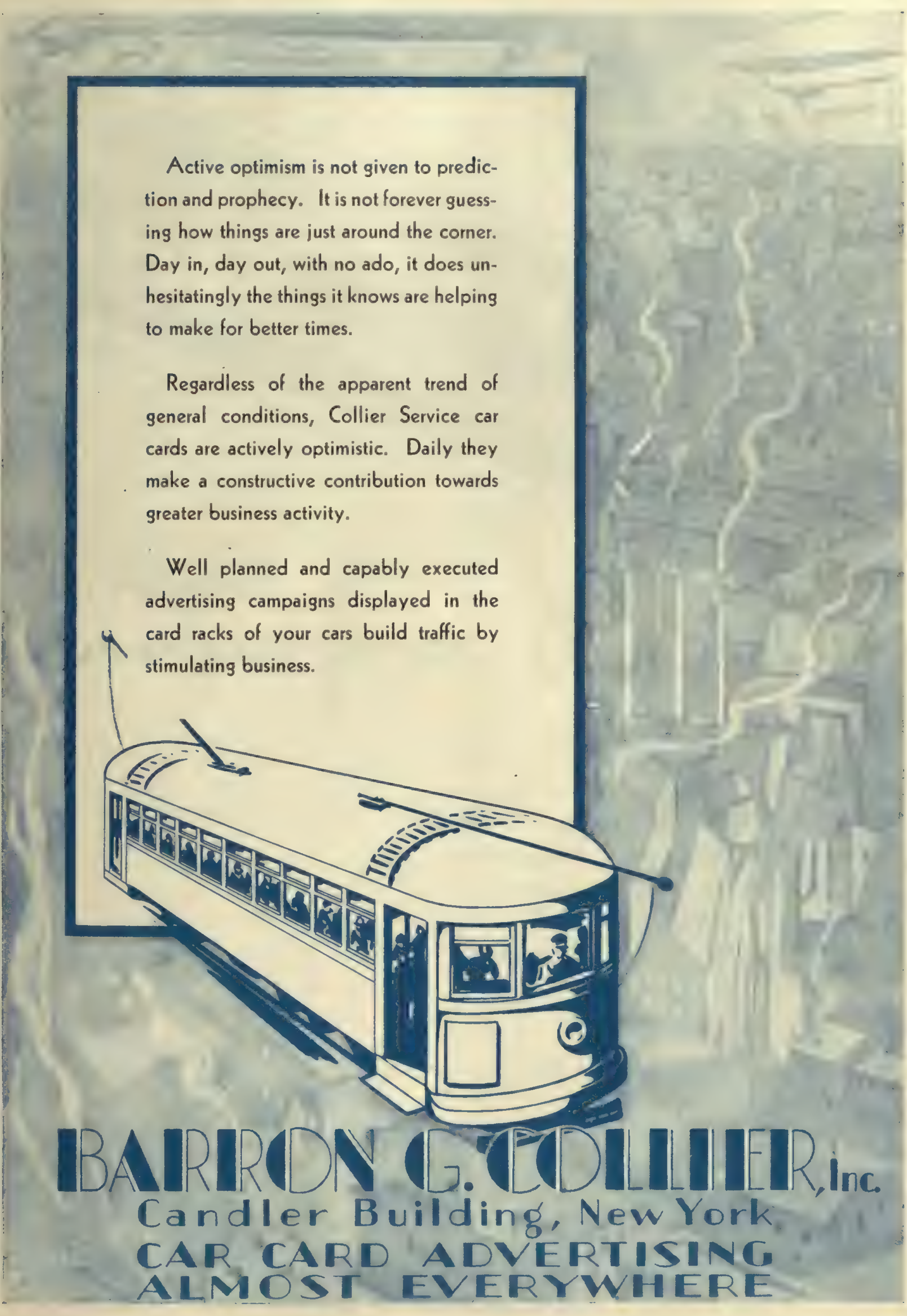
Whole populations bent their backs to the ancient problems of transportation—but today's swift transportation moves a pyramid's weight at a mile a minute pace on Gary Wrought Steel Wheels.

US STEEL

Illinois Steel Company

Subsidiary of United States Steel Corporation

General Offices: 208 South La Salle Street, Chicago



Active optimism is not given to prediction and prophecy. It is not forever guessing how things are just around the corner. Day in, day out, with no ado, it does unhesitatingly the things it knows are helping to make for better times.

Regardless of the apparent trend of general conditions, Collier Service car cards are actively optimistic. Daily they make a constructive contribution towards greater business activity.

Well planned and capably executed advertising campaigns displayed in the card racks of your cars build traffic by stimulating business.

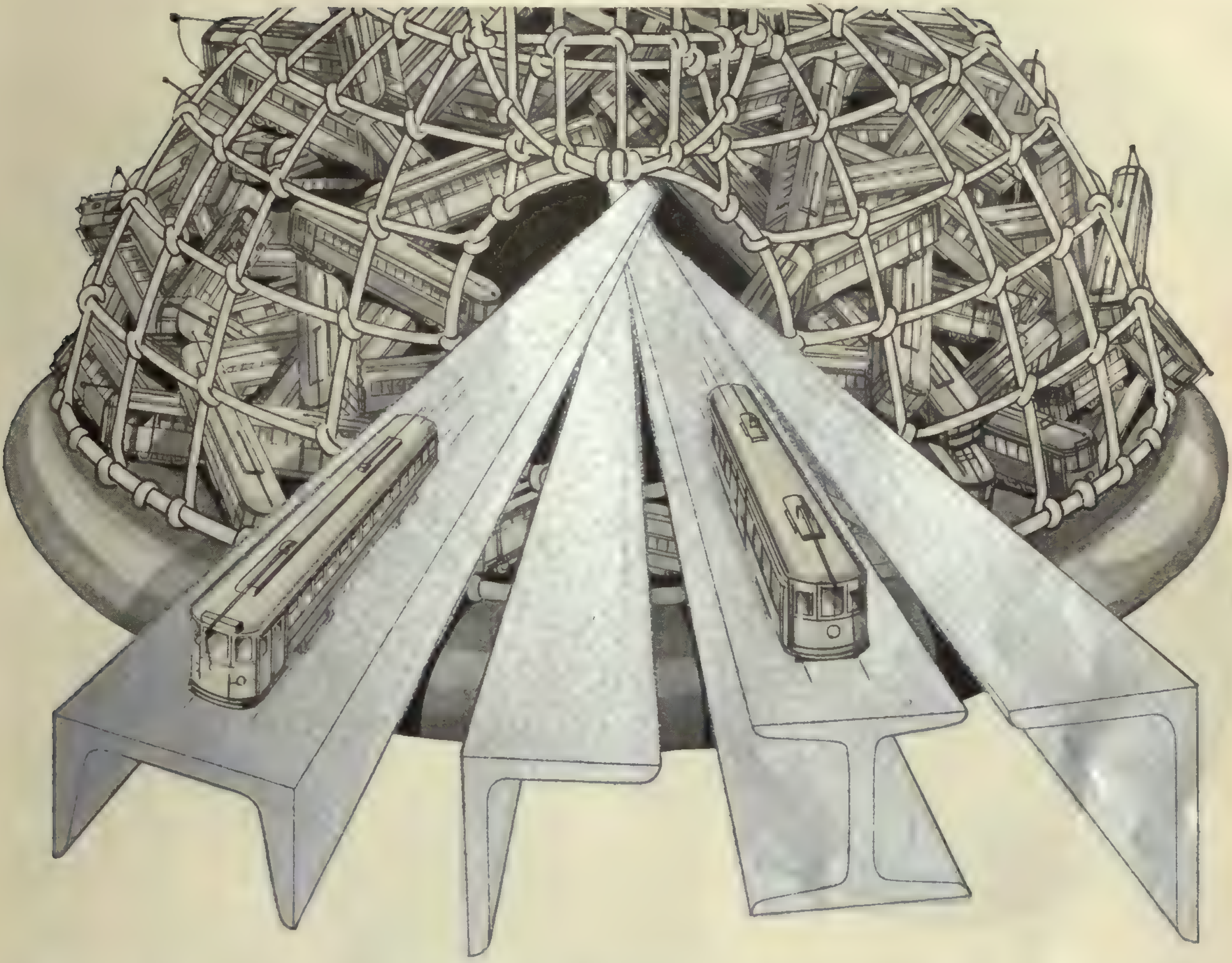
BARRON G. COLLIER, Inc.
Candler Building, New York
CAR CARD ADVERTISING
ALMOST EVERYWHERE

The SAFETY CAR . . .
CONTROL EQUIPMENT

Accelerates
Street Car Service

Waiting time of patrons is reduced by possible shorter headway between cars . . . time consumed in making stops decreased by quick brake application . . . standing time of cars reduced by rapid passenger interchange . . . and quick get away permitted by prompt release of the brakes.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



Break out of the trap of dead-weight

with Structural Shapes and Sheets of Alcoa Aluminum

Habit—just clinging to established ways of doing things—lures many a victim. Don't be trapped by obsolete dead-weight construction in street cars.

There is one way to escape. Replace surplus dead-weight metals with the strong alloys of Alcoa Aluminum which weigh only 1/3 as much and are the equivalent of structural steel in strength. Scrap the dead-load; pile on the pay-load; save power; increase your schedules; save wear on trackage and brakes.

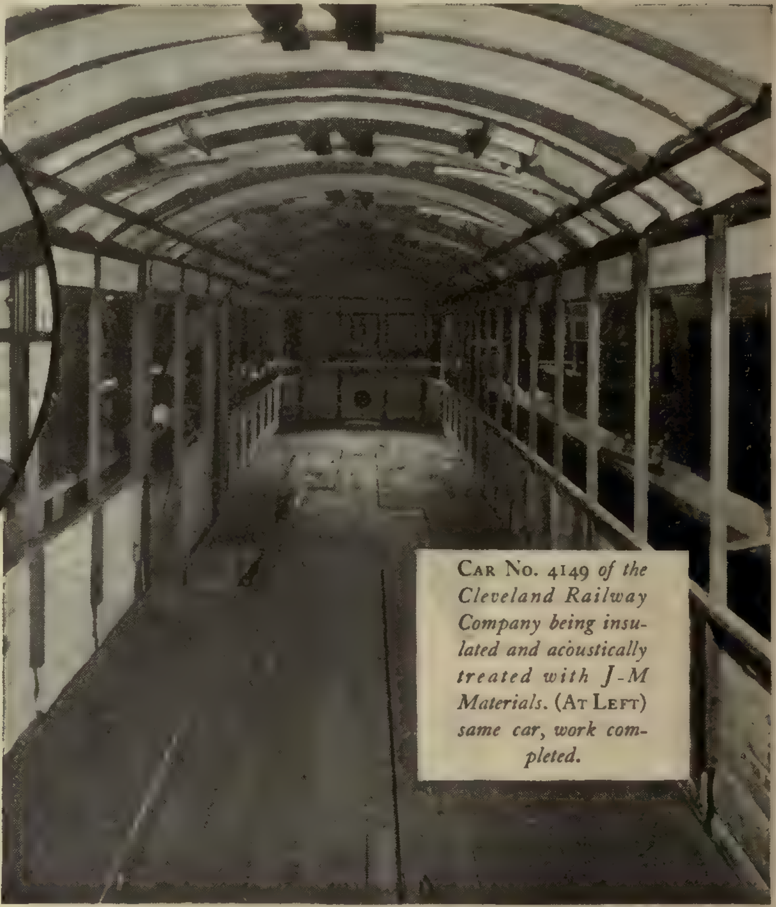
The slight additional cost of original equipment is soon charged off, while clear profits continue to accrue. No wonder one prominent street railway engineer says that he can easily pay \$1.25 for every pound of weight saved. And you can save up to 33.6% of the weight of every car. Safety is assured by a minimum tensile strength of 55,000 lbs. per square inch.

Standard structural shapes of the strong alloys of Alcoa Aluminum, used in street car construction, are carried in stock. Plates, rivets, bolts and screws are also available.

The engineering handbook, "Structural Aluminum," is available at \$1.00 a copy. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

quiet..your strongest Public Appeal



Car No. 4149 *of the Cleveland Railway Company being insulated and acoustically treated with J-M Materials.* (At Left) *same car, work completed.*

J-M develops the *noiseless car* to meet the increased rider demand for *quiet.*

COMPETITION is increasing—the public demands comfort and quiet as well as speed. Now Johns-Manville meets this demand with Acoustical Materials and Methods that make the QUIET car possible.

For example, in Cleveland, Ohio, J-M Insulation engineers completely insulated and acoustically treated street cars No. 4149 and 5014 while under construction for the Cleveland Railway Company. Floor, sides, rear end and roof deck were lined with J-M Insulation and Acoustical Materials. After several months' service, noise tests were conducted using for comparison an uninsulated car built at the same time.

The J-M insulated cars were from 67% to 77% less noisy than the uninsulated type. The quietness of the cars was comparable to a modern Pullman. In addition, the cars were cooler in summer and warmer in winter.

J-M Insulation Service puts in your hands one of the strongest competitive weapons of recent years. It will pay you to investigate. Address Johns-Manville, 292 Madison Ave., New York City.

Johns-Manville

JM *Service to Transportation*

In Pennsylvania nearly every other coach is a **YELLOW. . .**

Far more Yellow Coaches are in revenue service throughout the United States than any other make. Far more revenue passengers are carried by Yellow Coaches than by any other make. Yellow Coaches are revenue builders. For example . . . . . .

Nearly Every Other Coach in the Keystone State *is a Yellow Coach*

Since 1924, when the first Yellow Coach was purchased in the State of Pennsylvania, the Keystone State has shown an overwhelming preference for Yellows.

Today, Yellow Coaches predominate, on highways and in cities. *Nearly every other coach in revenue service in Pennsylvania is a Yellow*—

And Yellow has sold more than twice as many coaches as its nearest competitor—in a much shorter length of time. The record of Yellow penetration tells its own story.

Year	*Sales*	*Total*
1924	......	212
1925	71	283
1926	199	482
1927	262	644
1928	72	716
1929	133	849
1930	166	1015

These sales were made to 49 operators, which, collectively, have ordered Yellow Coaches 192 times—or an average of 4 times each.

Eight companies have reordered more than 10 times—four companies more than 15 times and one company more than 20 times—a striking vote of confidence in Yellow performance.

Moreover, 39 city transportation companies in Pennsylvania operate 830 motor coaches, of which 535 are Yellows—

65% Yellow preference. The following city coach operations are typical of the great popularity of Yellow equipment.

	Yellows	*Others*
Philadelphia	370	0
Pittsburgh	62	35
West Chester	31	3
Erie	26	0
Wilkes Barre	32	9
Altoona	7	16
Franklin	5	0
Conshohocken	2	3
	535	66

The Keystone State, like so many others in the Union, has rendered its decision in favor of Yellow Coaches. With every opportunity to test and compare, Pennsylvania operators choose Yellows on the basis of performance, operating economy and their ability to build revenue.

GENERAL MOTORS TRUCK CO., Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

In Pennsylvania—as throughout all America—it's

Yellow Coaches

Operators of Yellow Coaches in
PENNSYLVANIA

Harmony Short Line Transportation Co.	Pittsburgh, Pa.
Westmoreland Transportation Co.	New Kensington, Pa.
Saltsburg & Indiana Transportation Co.	Saltsburg, Pa.
Shamokin - Mt. Carmel Transportation Co.	Mt. Carmel, Pa.
Pennsylvania Greyhound Lines	Philadelphia, Pa.
Philadelphia Rapid Transit Co.	Philadelphia, Pa.
Pittsburgh Motor Coach Co.	Pittsburgh, Pa.
West Ridge Transportation Co.	Girard, Pa.
Chester Valley Bus Line, Inc.	West Chester, Pa.
Johnstown Traction Co.	Johnstown, Pa.
West Penn Electric Co.	Pittsburgh, Pa.
Logan Valley Bus Co.	Altoona, Pa.
Mon Valley Bus Co.	Clairton, Pa.
Valley Transportation Co.	Lemoyne, Pa.
Auch, Howard	Conshohocken, Pa.
Bamford, August & Bros.	Whitaker, Pa.
Beach, Edward	West Hazelton, Pa.
Dodaro, Anthony	Bradford, Pa.
East Coast Coach Co.	Philadelphia, Pa.
Fullington Bus Co.	Clearfield, Pa.
Glen Bus Co.	Scranton, Pa.
Huntingdon Broadtop R. R.	Huntingdon, Pa.
Pocohanne Lodge	Pocono Pines, Pa.
Rapid Transportation Co.	Carbondale, Pa.
Wayne Auto Transportation Co.	Hawley, Pa.
Southern Pa. Bus Co.	Wilmington, Del.
Wampum Bus Co.	Wampum, Pa.
Smith, L. B.	Harrisburg, Pa.
Erie Coach Co.	Erie, Pa.
White Transit Co.	Wilkes Barre, Pa.
Reading Transit Co.	Reading, Pa.
Somerset Bus Co.	Somerset, Pa.
Bus Service Corp.	Philadelphia, Pa.
Citizens Transit Co.	Oil City, Pa.
Waer Bus Co., Inc.	Easton, Pa.
Penn Bus Lines	Pittsburgh, Pa.
Elk Coach Lines	Philadelphia, Pa.
Hilltop Bus Co.	Beaver, Pa.
Edwards Motor Transit Co., Inc.	Dubois, Pa.
Schuylkill Transportation Co.	Philadelphia, Pa.
Beaver Valley Motor Coach Co.	Pittsburgh, Pa.
Wyoming Valley Auto Bus Co.	Wilkes Barre, Pa.
Reading Transportation Co.	Philadelphia, Pa.
Phillipsburg Motor Bus Co.	Phillipsburg, Pa.
Lehigh Valley Transportation Co.	Allentown, Pa.
Susquehanna Motor Coach Lines	Susquehanna, Pa.
Westside Motor Transportation Co.	Charleroi, Pa.
Arlington Mausoleum Association	Philadelphia, Pa.
Interstate Auto Transportation Co.	Blossburg, Pa.
School Dist. of Lower Merion Twp.	Merion, Pa.

Nearly every other coach in Pennsylvania is a

Yellow Coach

EVIDENCE OF SERVICEABILITY IN TROLLEY POLES

STRENGTH BY SPECIAL HEAT TREATMENT
STRENGTH BY HIGH QUALITY OF STEEL
STRENGTH DUE TO SPECIAL REINFORCEMENT
STRENGTH TO MEET ALL SERVICE CONDITIONS

THE first requirement in trolley poles is adequate and lasting strength, which must be provided without excessive weight. Economy in operation of the car, efficiency in service, and safety to the public will depend on the fulfillment of this demand.

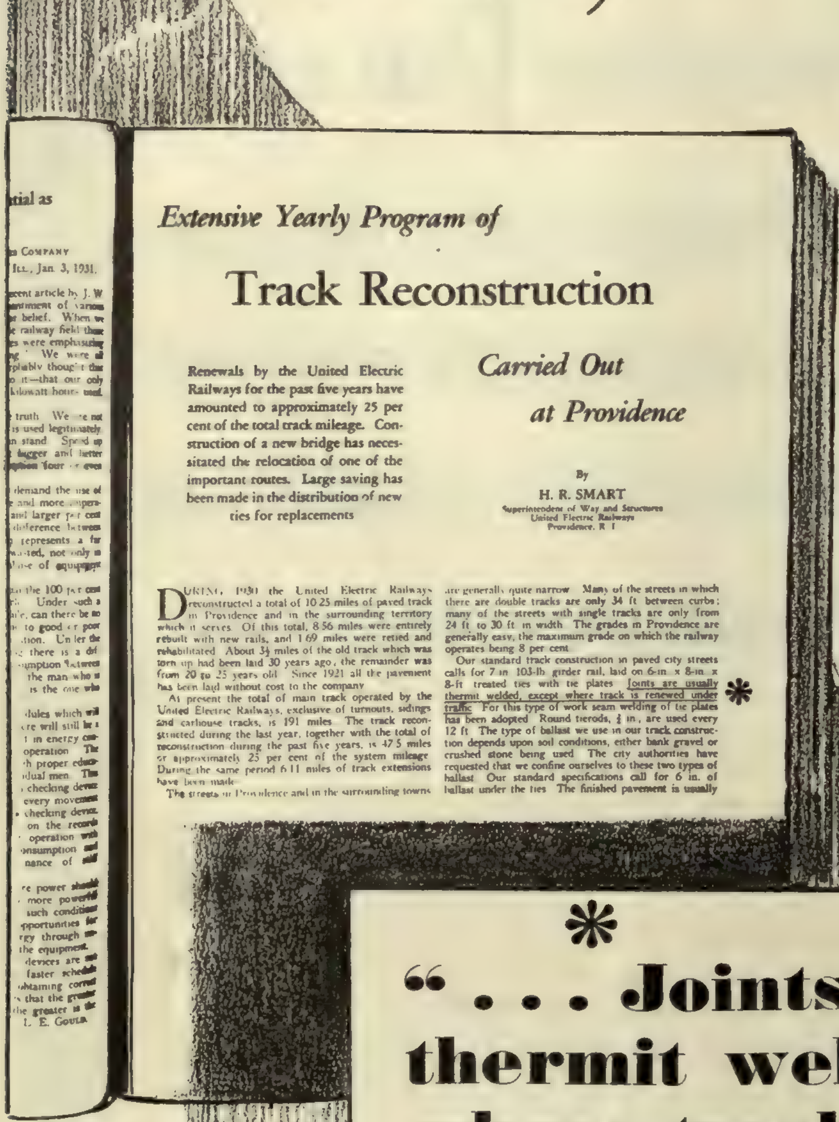
The heat-treating and other processes under which NATIONAL-SHELBY Trolley Poles are made, fully develop the potential qualities of the special, high-grade steel which has been chosen for superior strength.

The design of these poles gives complete balance, obviates undue weight, and puts maximum reinforcement where it is most needed. Every pole, before leaving the mill, undergoes the most thorough tests and inspections, to make sure that it is free from defect. Write for complete information.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL SHELBY SEAMLESS POLES

YES, Providence...and



Extensive Yearly Program of

Track Reconstruction

Carried Out

at Providence

Renewals by the United Electric Railways for the past five years have amounted to approximately 25 per cent of the total track mileage. Construction of a new bridge has necessitated the relocation of one of the important routes. Large saving has been made in the distribution of new ties for replacements

By

H. R. SMART

Superintendent of Way and Structures
United Electric Railways
Providence, R. I.

DURING 1930 the United Electric Railways reconstructed a total of 10.25 miles of paved track in Providence and in the surrounding territory which it serves. Of this total, 8.56 miles were entirely rebuilt with new rails, and 1.69 miles were retied and rehabilitated. About 3½ miles of the old track which was torn up had been laid 30 years ago, the remainder was from 20 to 25 years old. Since 1921 all the pavement has been laid without cost to the company.

At present the total of main track operated by the United Electric Railways, exclusive of turnouts, sidings and carhouse tracks, is 191 miles. The track reconstructed during the last year, together with the total of reconstruction during the past five years, is 47.5 miles or approximately 25 per cent of the system mileage. During the same period 6.11 miles of track extensions have been made.

The streets in Providence and in the surrounding towns are generally quite narrow. Many of the streets in which there are double tracks are only 34 ft. between curbs; many of the streets with single tracks are only from 24 ft. to 30 ft. in width. The grades in Providence are generally easy, the maximum grade on which the railway operates being 8 per cent.

Our standard track construction in paved city streets calls for 7-in. 103-lb. girder rail, laid on 6-in. x 8-in. x 8-ft. treated ties with tie plates. Joints are usually thermit welded, except where track is renewed under traffic. ✱ For this type of work seam welding of tie plates has been adopted. Round tierods, ¾ in., are used every 12 ft. The type of ballast we use in our track construction depends upon soil conditions, either bank gravel or crushed stone being used. The city authorities have requested that we confine ourselves to these two types of ballast. Our standard specifications call for 6 in. of ballast under the ties. The finished pavement is usually

✱

"... Joints are usually thermit welded, except where track is renewed under traffic"

Quotation from article on track reconstruction by H. R. Smart, Superintendent of Way & Structures, United Electric Railways, Providence, R. I., in the February, 1931, issue of Electric Railway Journal.

The METAL & THERMIT

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto

now, you can THERMIT WELD under traffic by this new development

New and improved methods now permit the Thermit welding of tracks *under traffic.*

Here's big news! Here's a new development in the use of Thermit welding that's been announced since the United Electric Railways of Providence completed its 1930 track program—a new opportunity to reduce track maintenance costs by extending the use of Thermit Welding.

Think of the time and money you can save by being able to cut out night work and over-time for your track workers—the complaints you can avoid and the trouble you can side-step by eliminating service interruptions over regular lines while track joints are being welded.

What an opportunity to extend the life of joints by giving them adequate strength and protection under heavy traffic—joints that couldn't be disturbed without tying-up service.

Yes, Providence, this certainly should be good news. And may we add just this: it is good, though not surprising news to us to read in this article that you have "used Thermit joints since 1920—and have had practically no failures."

Providence carried traffic through on one track while the other was being reconstructed.

Many of the double track lines in Providence operate along narrow streets. This is Eddy St., 34 ft. between curbs where track was laid in 1930.

ALTHOUGH the basic process is the same now, as when Thermit rail welding was first instituted in America twenty-five years ago, the methods and details are being constantly improved. Today Thermit welding, with the materials and equipment sold by the Metal & Thermit Corporation, is standard practice on most of America's leading city and suburban electric railway systems—both large and small . . . . Write for information on methods of Thermit welding under traffic.

CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto

18 Years of Reliable Service Behind—
Prolonged Years of Even Finer Service Ahead

Commercial transportation standards are invariably set by Reo.

Eighteen years ago, Reo first introduced light, more-power-for-weight, speedier, safer, lower-cost SPEED WAGONS, and has maintained engineering dominance ever since.

Hundreds of thousands of REO SPEED WAGONS and TRUCKS have been placed in operation in 64 countries, hauling structural steel down congested Broadway, bringing Brazilian coffee to coastal shipping ports, or patrolling the vast desert stretches along the Great Wall of China!

The same story of day-in-day-out reliability and astounding infrequency of repair has travelled the world around, and has won universal acceptance for REO products.

In face of these irrefutable results, the REO is deserving of a lasting place in your system of transportation service.

REO MOTOR CAR COMPANY, LANSING, MICHIGAN

SPEED WAGONS REO AND TRUCKS

Double track construction with Bethlehem No. 3 Steel Ties.

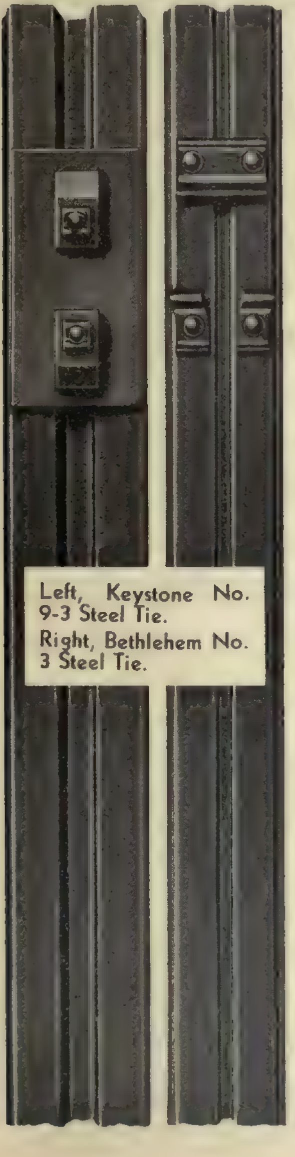
BETHLEHEM STEEL TIES

◆

lower cost of construction

◆

lower cost of maintenance



Left, Keystone No. 9-3 Steel Tie.
Right, Bethlehem No. 3 Steel Tie.

In large cities and in suburban communities with paved streets, Bethlehem Steel Ties are showing substantial returns in lower cost of track construction, and in maintenance.

These steel ties are more easily laid than wood ties. Their shallow section reduces the amount of excavation and concrete necessary to install them and brings a reduction in labor. Spiking, gaging and tie plates are eliminated. Less time is required to attach rails to Bethlehem Steel Ties due to the simplicity of their fastenings. The Bethlehem No. 3 Steel Tie has two broad stationary clips and four movable clips securely riveted to the tie. The Keystone No. 9 Steel Tie has a tie plate welded to the tie and four rail clips, which are securely held in position over the rail base by $\frac{3}{4}$ in. bolts and Unit Lock Nuts. Bethlehem Steel Ties hold the rails to gage and in alignment.

The Long life of Bethlehem Steel Ties greatly lowers the cost of track maintenance. In large cities where, due to the heavy traffic, the life of the rails is short, they may be renewed with a minimum of expense by removing the concrete immediately surrounding them and attaching the new rails to the steel ties left imbedded in the concrete.

Keystone No. 9 Steel Ties used in construction of curve.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM

Polarine passes test more severe

Great motor oil test conducted by A.A.A. at Indianapolis Speedway

Polarine
MOTOR OIL
STURDY AND RICH

100,000 MILES TRAVELED

1,000,000 OBSERVATIONS MADE

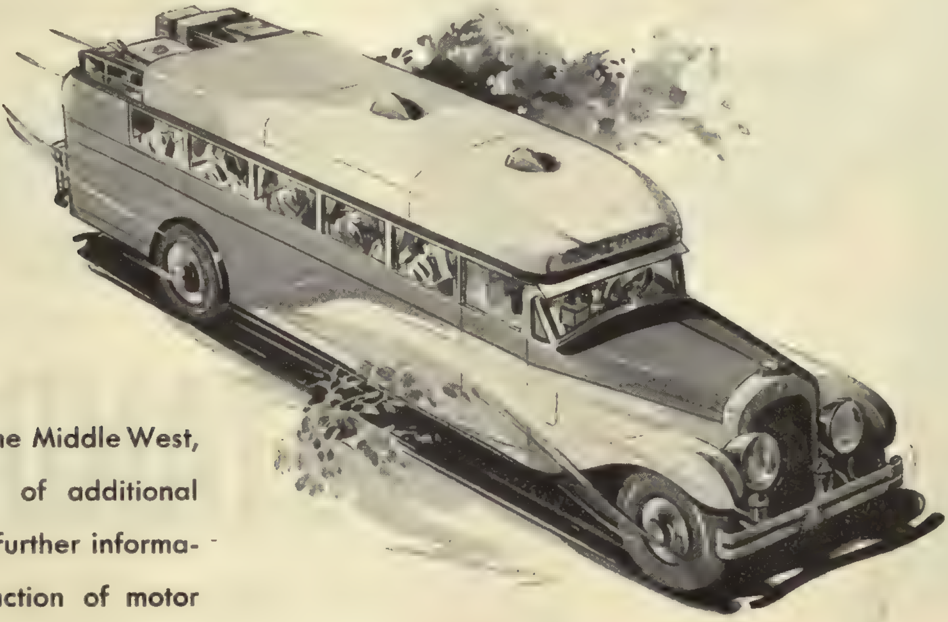
Complete test to require seven months

For many weeks New Polarine has been subjected to what is probably the most thorough and comprehensive lubrication study ever made.

During the tests, conducted at the Indianapolis speedway under the direct control of the A. A. A., thirteen cars were run night and day, at all ranges of speed; each run of 1,000 miles made at a predetermined speed which was maintained. They rolled up a total of 100,000 miles while subjecting New Polarine motor oil to the most gruelling lubrication tests ever devised. No ordeal was overlooked. It has been estimated that nearly a million observations were recorded. Now, these cars are starting on a

POLARINE MOTOR OIL IS USED BY MOST

than Motor Coach operation...



five months' tour of the Middle West, piling up thousands of additional miles and gathering further information regarding the action of motor oil under actual driving conditions. Special instruments have been installed to record oil and water temperatures at different speeds, fuel and oil consumption at various speeds. Also, a careful check is being made on carbon formation, cylinder wear, chassis lubrication and condition of oil after each test.

The information gathered during the speedway test runs checked the findings of our technical staff. The results have proved conclusively that Polarine is a competent, dependable motor oil.

2 great advantages from using Polarine Motor Oil

First—you are assured of positive, thorough lubrication. Polarine has proved its great lubricating qualities not only in this great lubrication test but also in hundreds of motor coaches throughout the middle west.

Second—Polarine and Red Crown Gasoline, work together with an efficiency of operation and economy that few gasolines and motor oils can equal. Red Crown and Polarine have been refined to give maximum efficiency and lowest possible economy of operation when used together.

Test Polarine and Red Crown in one of your motor coaches. Check the performance and cost.

STANDARD OIL COMPANY
(Indiana)
910 S. Michigan Avenue Chicago, Illinois 1205B

LARGE MIDWESTERN MOTOR COACH OPERATORS

"STANDARD"

steel wheels, axles and armature shafts are good equipment for cars, when the operator desires safety, quick starts and stops, comfort and economy. The buyer is paid a just return for his wisdom in selecting "Standard" Parts.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICE & WORKS: BURNHAM, PENNA.

CHICAGO
NEW YORK
PHILADELPHIA

ST. LOUIS
RICHMOND

AKRON
PORTLAND
SAN FRANCISCO

DeVilbiss

HEADQUARTERS FOR SPRAY-PAINTING AND FINISHING EQUIPMENT FOR ELECTRIC RAILWAYS

In the electric railway industry, DeVilbiss Spray-painting and Spray-finishing Equipment has an amazing number of uses.

From bridges to seat brackets, every painting requirement among the electric railways can be met better by the use of DeVilbiss Spray-painting Equipment. There are many highly efficient DeVilbiss Portable Outfits for painting bridges, poles and buildings on the roadway.

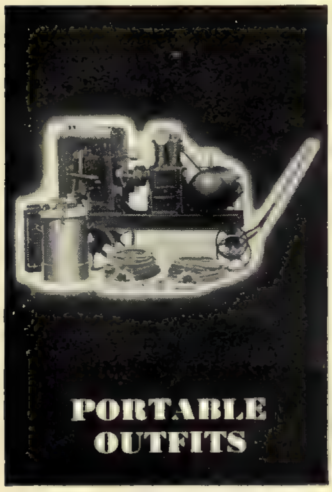
There are larger, permanently installed outfits with special exhausting equipment to keep rolling stock, passenger and freight, up to the minute in appearance and thoroughly protected against the elements. The new practice of "dressing up" street cars and buses which draws traffic and increases revenue, could never have been practical without the economies made possible by DeVilbiss Equipment.

Electric railway executives striving to keep down costs should ask for interesting facts and figures on spray-painting operations. Call the nearest DeVilbiss office or write,

THE DeVILBISS COMPANY · TOLEDO, OHIO

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS LOS ANGELES SAN FRANCISCO WINDSOR, ONTARIO

Direct sales and service representatives available everywhere



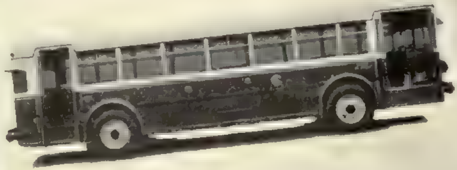
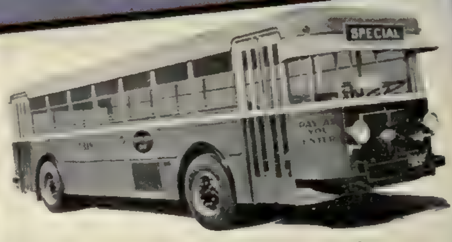
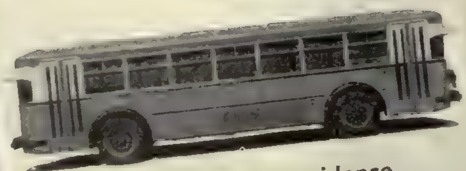
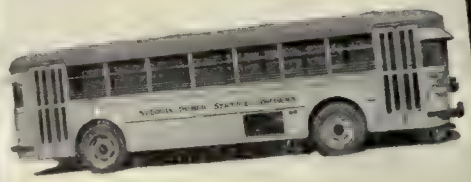
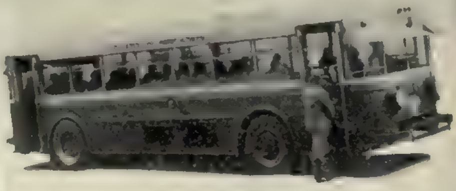
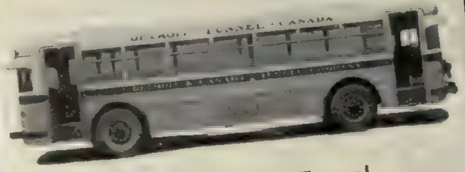
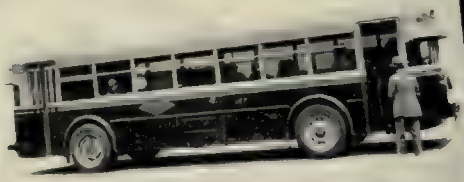
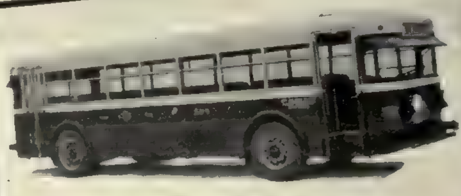
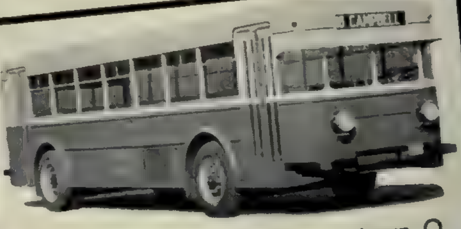
PORTABLE OUTFITS

SPRAY-GUN

EXTENSION SPRAY-GUN

PRESSURE TANK

After Four Years

1927	 Chicago Surface Lines	 N. O. P. & L., Akron, Ohio
1928	 United Railways, Providence	Boston Elevated Railway
1929	 St. Louis Public Service Co.	 Detroit Motorbus Co.
1930	 Detroit & Canada Tunnel	 Capital District Transp. Co., Albany
1931	 Milwaukee Electric Railway	 Youngstown Municipal, Youngstown, O.

- *Their Design is Still Modern*

Their Style is Copied Widely

Their Present Life Will Be At Least Doubled

Their Capacity and Appeal Are Unchallenged

Service . . .
TWINS
WHIP DEPRECIATION

TWIN COACH equipment for 1931 conforms to the same basic design and appearance as were established in 1927 because the continued experience has justified their permanency.

Every Twin is mechanically insured and protected against model and style changes . . . Every improvement in design is applicable to units already in operation . . . Obsolescence is reduced to a minimum.

Only in the purchase of this type of equipment do we believe it is possible for the buyer to operate with the rate of depreciation which assures profits.

Herein lie the reasons for the continual lowering of Twin Coach operating costs.

Twins of *standard design* are built in 21 to 23–27–33–40 seat capacity. We will be pleased to send you complete information regarding these coaches and also the story of our *new 17 to 20 seat Taxi-Coach model* with automatic fare collection.

Twin Coach
BY F.R.FAGEOL KENT, OHIO

"How can I still further Reduce Costs?"

THE Texas Company has some striking facts and figures on this question. They are records of actual savings accomplished in reduced shop costs on many of the leading roads. They show what can be done through the Texaco System of car journal lubrication.

This new Texaco System, of which Texaco Lovis Oil and Texaco Oil Seals are important parts, was introduced but a few years ago. Its economies were quickly apparent. Today, it is acknowledged by a number of well-known Master Mechanics to have opened up entirely new sources of operating and maintenance savings previously thought impossible.

The advantages of this new lubrication can easily be proved—by the recorded experiences on other roads—and by tests on your own lines.

Texaco engineers will gladly arrange to go into this whole question. Would you like to have the data? The capital investment required is surprisingly low. Write The Texas Company.

TEXACO LUBRICANTS

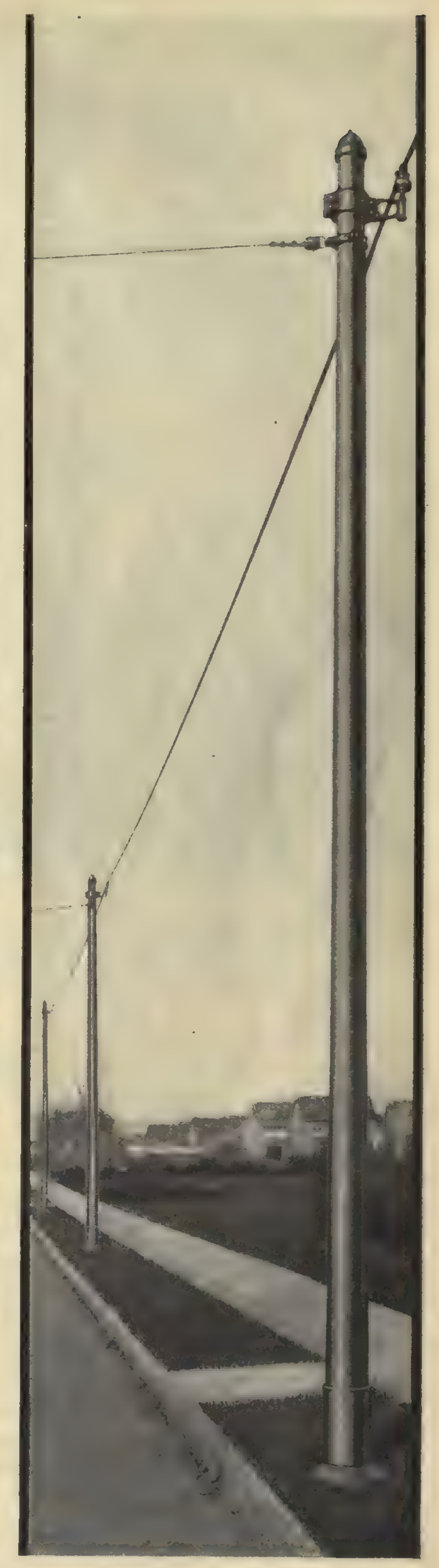
THE TEXAS COMPANY
135 East 42nd Street, New York City

MONOTUBE POLES MEAN . . .

Low Cost . . .	DESPITE the many constructional advantages which have been incorporated for the first time in any pole, the cost of Monotubes compares favorably with that of ordinary steel poles.
Long Life . . .	UNION METAL engineering has built into Monotubes many long years of trouble-free service. Complete ventilation, (in the case of anchor rod construction) no horizontal joints, and the lessening of ground line corrosion are contributing factors.
Cold-Rolled Steel	HIGH GRADE open hearth steel plus Union Metal cold-rolling provides poles which are stronger and longer lived.
Better Appearance	ONE PIECE, tapered construction, eliminating all horizontal joints makes Monotubes the most attractive tubular steel poles on the market.
Great Strength .	MONOTUBES can be supplied to meet any ordinary strength requirement while allowing an adequate factor of safety.
Adaptability . .	MONOTUBE POLES are used for the support of trolley span wires, distribution and transmission lines, traffic signals — in fact, wherever a general service pole is required . . . They may be embedded directly in the ground or in concrete or may be attached to a concrete foundation by means of anchor rods.

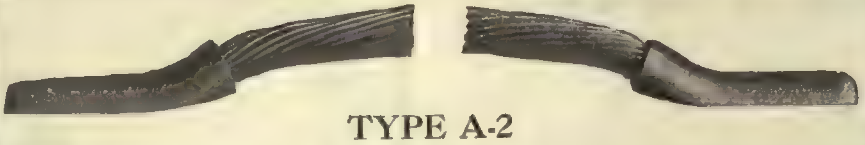
Write for prices and catalogs.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY · · · CANTON, OHIO
SALES OFFICES · New York · Chicago · Boston
Los Angeles · San Francisco · Seattle · Dallas · Atlanta
DISTRIBUTORS
General Electric Merchandise Distributors Graybar Electric Company, Inc.
Offices in all principal cities

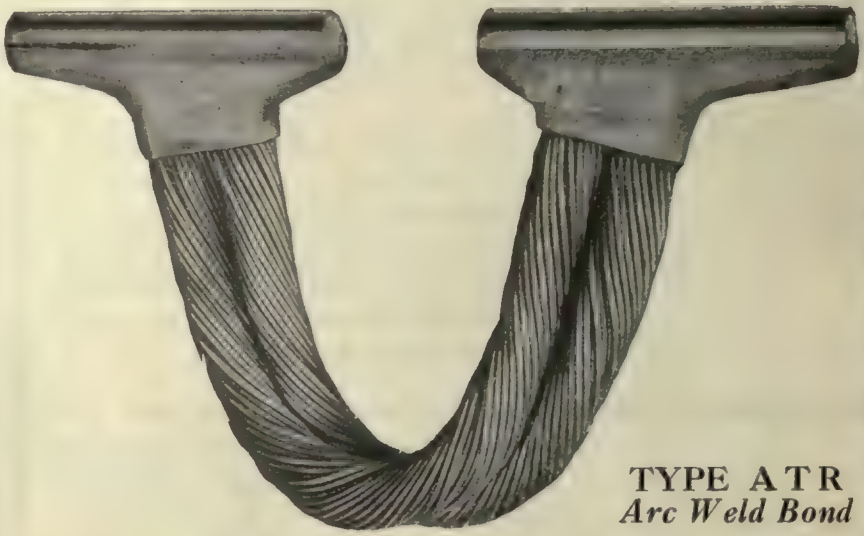


Monotube Pole with ground collar, embedded in concrete.

UNION METAL MONOTUBE POLES



TYPE A-2
Arc Weld Bond



TYPE A T R
Arc Weld Bond

the A-2 *and the* ATR

they complete your set-up for ARC-WELDING

These two bonds will meet all your requirements for arc weld bonding. Both are designed to make welding easy—and sure.

Type A-2 bonds are for application on the top of the rail base, around special work and for cross bonding. The wide welding vee, formed between the terminal and the rail, makes it easy to secure a good, sound weld with the very first bead of weld metal applied. Full conductivity of the bond is developed.

Type A T R are applied to the ball of the rail. They are designed to make it easy to hold a short arc, resulting in a superior weld. Note a sleeve protects the bond cable from the arc. It is necessary to deposit only a very small amount of weld metal to secure a large contact area with the rail. The current path through the arc weld metal from the bond to the rail is a minimum making a very low resistance bond. A good bond, well made, the A T R will solve your bonding problems.

These bonds and other arc weld types are shown in Circular No. 16.

Let us send you samples—no obligation.

The ELECTRIC RAILWAY IMPROVEMENT CO.
2070 E. 61st Place, Cleveland, Ohio

***(Above)* North Illinois Street, Indianapolis, Ind.**

***(Right)* Same paving partially completed**

Carey Elastite

RAIL FILLER

INSURES TRACK PAVING

Paving next to tracks must be protected from track vibration. The more permanent the paving, the greater the need. The combination of modern, heavy rails and large cars means that the track transmits terrific shocks which attack even the most resistant pavement. The damage is progressive because vibration play increases as vibration limits grow larger.

Carey Elastite Rail Filler placed in the web of the rail, absorbs vibration which would otherwise cause speedy damage. The material is a tough asphalt compound which offers maximum resistance to shock, temperature changes and moisture. Premoulded to fit any rail section, it is quickly installed and repays its cost in a short time by reducing paving repairs.

Prices and complete engineering data will be mailed on request.

THE PHILIP CAREY COMPANY ✖ Lockland, Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
ROOF PAINTS

Carey PRODUCTS
EST. 1873

HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

One Man in Forty—
and YOU *are the Man*

DID you ever stop to think that *you* are one of the comparatively small percentage of men whose "yes" or "no" really matters to American business?

Every morning 40,000,000 men start to work—in factories and mines, banks, railways, stores and other centers of industry or trade. Forty million men turn the wheels that keep America clothed, sheltered and fed.

But only one million of them make business decisions. Only one man in forty has the ability, the responsibility or the authority to say yes or no in business matters. Hence the *real* managing power of the country lies in the hands of these million men—less than one per cent of its total population.

As a member of this group—this controlling minority—you share an important responsibility—the triple responsibility of wisely liberal purchasing of generous employment and of sane management to hasten the return of general prosperity.

• • •

How, you ask, do we know that *you* are one of the million who make decisions for others to follow? Because men who read business papers are alert and eager for news of new plans, new methods, new equipment. That is *why* they are the men who control affairs.

THIS SYMBOL *identifies an ABP paper . . . It stands for honest, known, paid circulation; straightforward business methods, and editorial standards that insure reader interest . . . These are the factors that make a valuable advertising medium.*

ELECTRIC RAILWAY JOURNAL

IS A MEMBER OF

THE ASSOCIATED BUSINESS PAPERS, INC.

TWO-NINETY-FIVE MADISON AVENUE - NEW YORK CITY

450,000 miles per year with

A MINIMUM OF ROAD DELAYS

more proof of LONG UNINTERRUPTED, LOW-COST Silvertown performance . . from *Danbury Interurban Bus Co.*

WRITES E. J. Gilden, President of the Danbury Interurban Bus Co., "*Our busses are equipped with Goodrich Balloons which have averaged 37,544 miles per tire with a minimum of road delay and cost per tire mile. Since equipping with Goodrich Balloons, drivers report a decided improvement in the riding qualities of the busses. This record bespeaks our continued use of Goodrich Balloons.*"

Hundreds of letters like this from bus operators who have "tried them all" suggest that the right answer to your tire problems is Goodrich Bus Balloons.

The B. F. Goodrich Rubber Co., Est. 1870, Akron, Ohio. Pacific Goodrich Rubber Co., Los Angeles, Calif. In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont. The International B. F. Goodrich Corp. (Export).

BUS OPERATORS

say

"Goodrich Tires have played a vital part in helping us to expand our operations and maintain our schedules."

"We are entering our fifth year on Goodrich 100%."

"30% more mileage—10 m.p.h. faster."

"Out of 301,600 trips, 3,784,007 bus miles per year—only ten trips lost due to tire trouble."

"The finest tire we know of for trouble-free mileage."

Goodrich *Bus* Balloons

SPECIFY GOODRICH ON YOUR NEW BUSSES

ROEBLING

TROLLEY WIRE is an important Roebling product and hundreds of miles of it span the country. Yet it is merely one of many types of Roebling Electric Wires and Cables serving electric railways everywhere.

Locomotive wire, bond wires, pantograph cable, power cables, parkway cables, railway signal wires and cables—these are simply a few of the Roebling Wires and Cables made for electric railway service. There is hardly an electric wire and cable need that cannot be satisfied by the complete and diversified Roebling Line.

Your inquiry for further information and prices would be welcomed by any Roebling office listed.

Railway Signal Wires and Cables » Parkway Cables » Power Cables; Paper, Cambric, Rubber; Braided or Leaded » Car Wire » Locomotive Wire » Bronze Trolley Wire » Copper Trolley Wire » Copper Transmission Strand » Guy Wire and Strand » Bond Wires » Ground Wires » Welding Cable; Trailing and Electrode Holder » And a wide variety of other Wires and Cables.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
Atlanta Boston Chicago Cleveland Los Angeles New York
Philadelphia Portland, Ore. San Francisco Seattle Export Dept., New York, N. Y.

ELECTRICAL WIRES AND CABLES

One of the 53 Socony fueled and lubricated buses operated by the Brooklyn Bus Corporation

53 MODERN B.M.T. BUSES keep down costs with SOCONY

The fifty-three modern buses operated in Brooklyn and Queens, New York, by the Brooklyn Bus Corporation, a unit of the Brooklyn-Manhattan Transit System*, travel 5400 miles a day.

Socony Banner Gasoline, the New Socony Motor Oil and Socony lubricants have justified their use in these buses by keeping performance up and repair bills down.

Your fleet, too, can be operated with equal satisfaction and economy with Socony products.

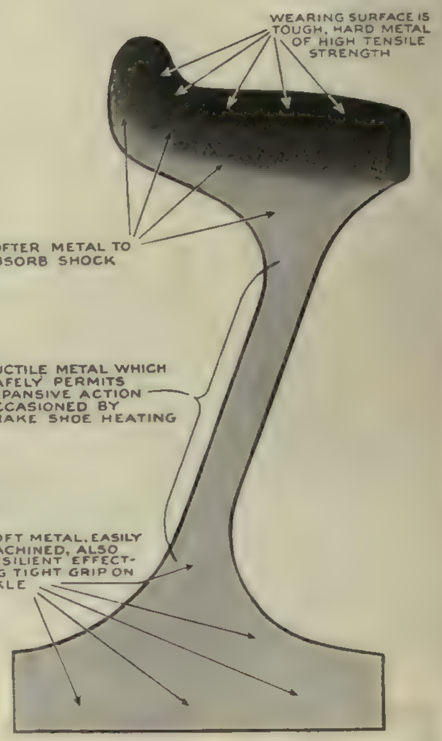
***The Brooklyn-Manhattan Transit System's subway equipment in New York City is lubricated with Socony industrial lubricants.**

SOCONY

BANNER GASOLINE · NEW SOCONY MOTOR OIL
SPECIAL GASOLINE plus ETHYL

STANDARD OIL COMPANY OF NEW YORK

Meeting Conflicting Requirements


WEARING SURFACE IS TOUGH, HARD METAL OF HIGH TENSILE STRENGTH
SOFTER METAL TO ABSORB SHOCK
DUCTILE METAL WHICH SAFELY PERMITS EXPANSIVE ACTION OCCASIONED BY BRAKE SHOE HEATING
SOFT METAL, EASILY MACHINED, ALSO RESILIENT EFFECTING TIGHT GRIP ON AXLE

A proper distribution of required physical properties

THE tread and the hub of a wheel won't agree as to what constitutes good material. One wants hardness and wear resistance, and the other wants ductility and shock resistance. To reconcile these opposing views and develop precisely the qualities needed in each part is the purpose of the special heat-treated composition of the Davis "One-Wear" Steel Wheel. Only such a special material can develop the unusual characteristics that make a steel wheel truly "One-Wear."

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Control* of fares is just as important as control of your cars

Properly designed tickets and transfers are absolutely essential for control. Take transfers, for example:—

TIME: Either the P.M. coupon or one of the tear-off forms is an instantaneous key to time control.

PRIVILEGES: Color, coupons, bar designs, skeleton lettering, IN or OUT forms, all are signals controlling proper use according to lines, transfer points, direction, car to bus, re-transfer and like privileges.

DATE: More and more properties are adopting Daily Dating to control abuse and to control loss of time in issuing and collecting.

AUDITING: Accurate numbering is the auditor's best control. Carelessness, errors and unknown leaks often can be caught only through the numbering control.

Most executives recognize that Globe has specialized in the design and production of tickets and transfers for more than half a century. They seek our advice on important fare control questions. Why not you?

FACTORIES:
Philadelphia
Los Angeles
Boston
New York
Atlanta

GLOBE
TICKET COMPANY
PHILADELPHIA

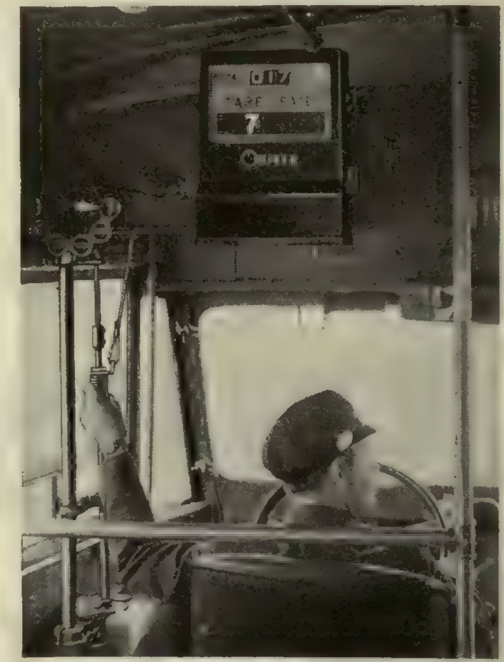
SALES OFFICES:
Cincinnati
Pittsburgh
Baltimore
Cleveland
St. Louis
Des Moines

Better Business...

A clear indication of the fare, a correct registration of the fare and a permanent entry on an untamperable printed record of all the facts relating to each fare, these are Ohmer essentials inseparable from the use of any type of Ohmer Fare Register.

For city service, for both electric railways and motor bus lines, we especially recommend the No. 3 Type. Many improvements have been made from time to time in this register to meet the changing needs of the industry. These improvements together with its newly designed cabinet have made it a thing of beauty as well as an instrument of the greatest usefulness.

Ohmer Fare Registers are made to meet every possible need. Let us show you a definite way to better business through more effective control of your income at its source.



A Motor Bus Installation

Ohmer Fare Register Company

DAYTON, OHIO, U. S. A.

On Guard!

ACCIDENTS won't happen at railway crossings guarded by Nachod Signals. Two commanding red lights, flashing on and off, and an insistent bell automatically warn of every car's approach. Full 24-hour safety, made doubly sure by a motorman's indicator. No property loss. No damage suits. Passenger good-will maintained. Let us quote you the cost of safe-guarding crossings on your lines.

"Nachod Spells Safety"

NACHOD SIGNAL

NACHOD & U. S. SIGNAL CO. INC.,
Louisville, Ky.

PANTASOTE

TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

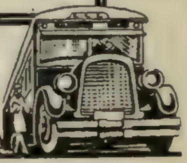
AGASOTE

TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses

Samples and full information gladly furnished.



The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK

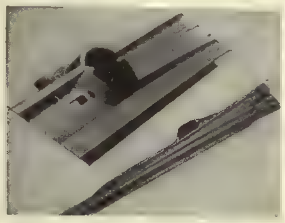
SERVING and Saving

under Modern Traffic Conditions

WHARTON

Special Trackwork

New Wharton Scientifically Designed Crossing
Pat. No. 1591706



The New Wharton Switch

Subway Layout

Surface Layout

WHETHER your trackwork requirements are for complicated layouts or for only a single piece—for subway or surface lines—for slotted work or steam crossings—Wharton Special Trackwork will provide maximum resistance to wear and tear and enable you to keep each item of maintenance at a minimum. It will serve *and save* under every traffic condition. Wharton engineers will be glad to discuss your special trackwork problems with you.

Solid Manganese steel and keyed center trackwork.

Expansion Joints

Draw Bridge Guides

William Wharton Jr. & Co.,
INCORPORATED
EASTON, PENNSYLVANIA

SALES OFFICES: Chicago Houston Montreal New York
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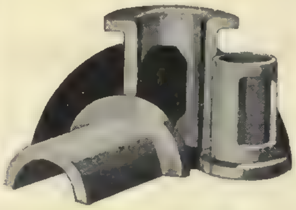
NATIONAL ELECTRIC RAILWAY SPECIALTIES

You can be sure of successful and economical results by including these specialties in your plans for modernization. It pays to standardize on National Products.

"Armature" Babbitt Metal

Let our specialists cooperate with you. They are experienced in your problems.

The "Vigne" Bimetallic Armature Bearing



"Tiger" Bronze Axle and Armature Bearings

"More-Jones" Trolley Wheels and Harps

NATIONAL BEARING METALS CORP.
St. Louis, Mo.

New York, N. Y. Jersey City, N. J. Pittsburgh, Pa.
Meadville, Pa. Portsmouth, Va. St. Paul, Minn.

FABRICATED
STRUCTURAL
STEEL

For all
kinds of
BRIDGES
and
BUILDINGS

AMERICAN BRIDGE COMPANY
Subsidiary of United States Steel Corporation

Manufacturers of
STEEL STRUCTURES
for every purpose

General Office: 71 BROADWAY, NEW YORK, N. Y.
Offices in principal cities

**Locating
Defective
Bonds!**

ROLLER-SMITH BOND TESTERS

Bulletin G-200 describes different types of testers. Write for this Bulletin.

Why permit defective rail bonds to interfere with current return through the rails? Why stand for continuous power losses? Why risk electrolysis damage?

Find those broken bonds with a Roller-Smith Bond Tester. It's *a one man* proposition, accurate, direct-reading, easily handled and fast. Fits every kind of rail-head.

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

2128 Woolworth Bldg.
NEW YORK

Works
BETHLEHEM, PA.

Offices in Principal Cities in U. S. and Canada

TUCOLITH
FLEXOLITH

Long Wearing

Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

1. Long Life
2. Attractive
3. Non-Slip Surface
4. Fireproof
5. Sound Deadence
6. Sanitary

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
PEOPLES GAS BLDG.,
122 S. MICHIGAN AVE., CHICAGO

For track areas
use
Brick Pavements

✢

Improves your service and
lowers your costs

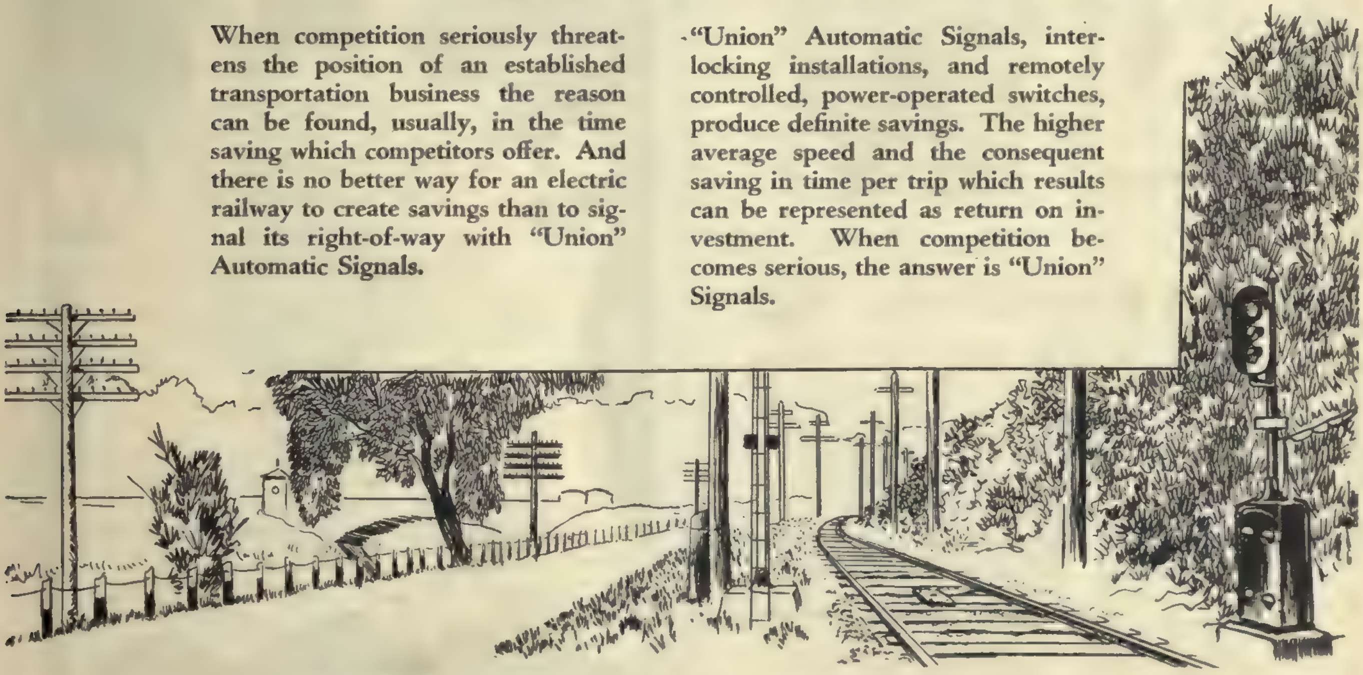
✢

Write National Paving Brick Manufacturers Association,
1245 National Press Building, Washington, D.C., for data.

WHEN COMPETITION
BECOMES SERIOUS

When competition seriously threatens the position of an established transportation business the reason can be found, usually, in the time saving which competitors offer. And there is no better way for an electric railway to create savings than to signal its right-of-way with "Union" Automatic Signals.

"Union" Automatic Signals, interlocking installations, and remotely controlled, power-operated switches, produce definite savings. The higher average speed and the consequent saving in time per trip which results can be represented as return on investment. When competition becomes serious, the answer is "Union" Signals.



1881 TRADE US&S MARK **Union Switch & Signal Co.** TRADE US&S MARK 1931
SWISSVALE, PA.
NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO

IT ISN'T ALL FUN
FOR A TROLLEY WHEEL

IT'S easy for any trolley wheel to run smoothly and provide ample conductivity in balmy weather.

But when rain, snow, and sleet whip trolley wires, it isn't fun for trolley wheels.

That's where Kalamazoo Trolley Wheels prove their value. Ample conductivity is always present for those who standardize on Kalamazoo Trolley Wheels.

It is significant that many Electric Railway Companies use them as a basis for comparison.

Write for details and bulletins.

THE STAR BRASS WORKS
KALAMAZOO, MICHIGAN

KALAMAZOO

THE COST IS SMALL—
THE SAVINGS LARGE

Install
INTERNATIONAL
CAR AND BUS REGISTERS at
small expense, and reap large profits. They are the most economical and effective way of putting *your* fares in *your* bank account. Eliminate errors, disputes, losses. Standardize on Internationals.

Take advantage of our FREE TRIAL offer
●
Ask us about it

INTERNATIONAL
REGISTER COMPANY
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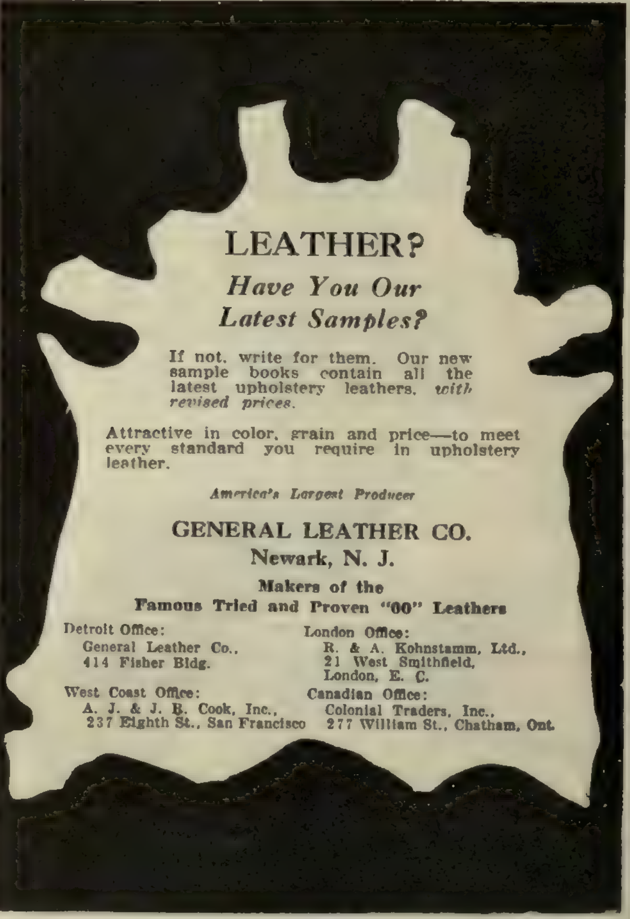

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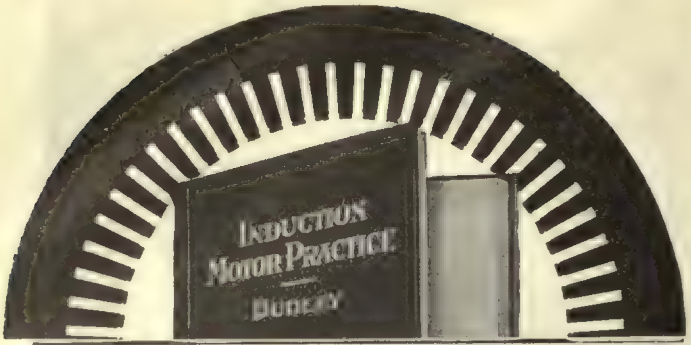

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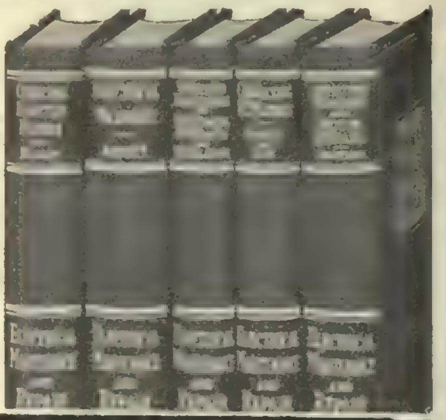

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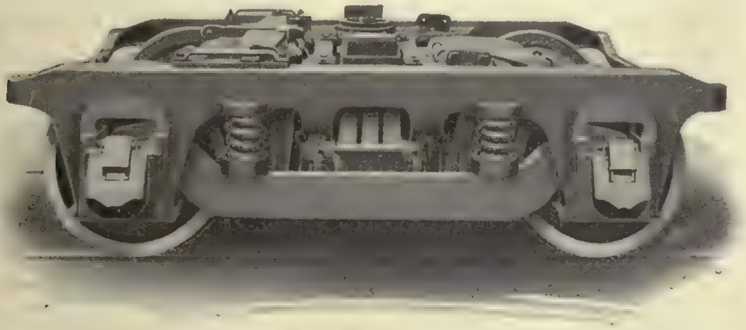

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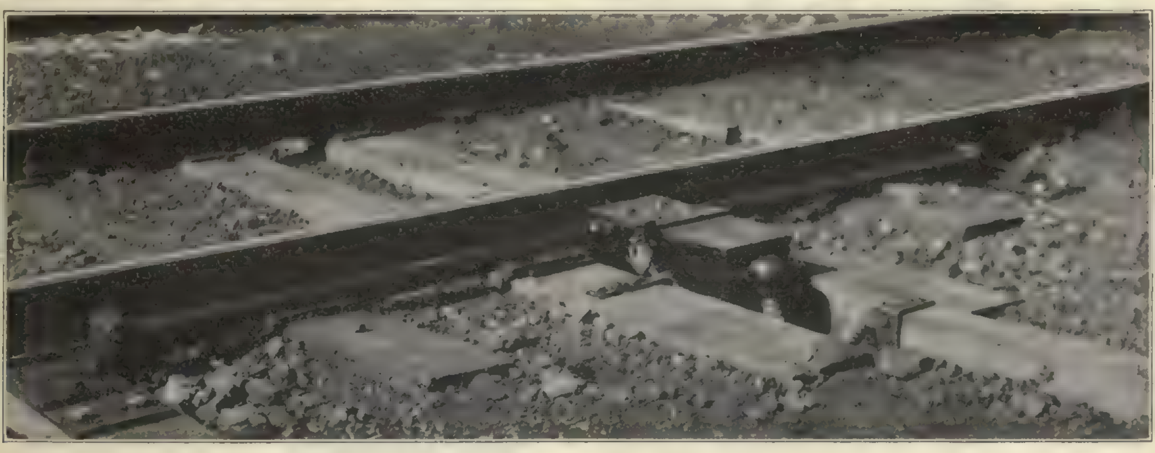

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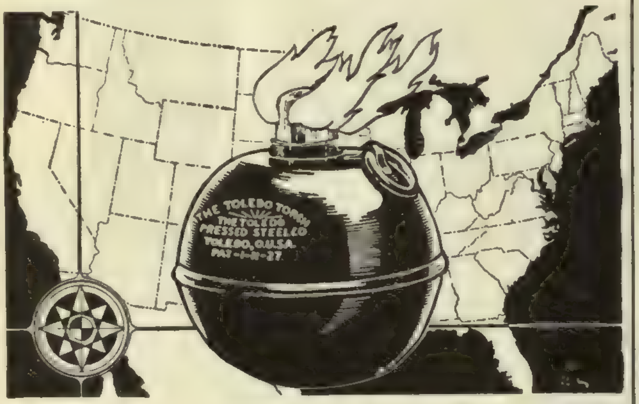

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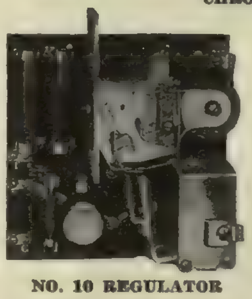

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Closes May 22nd

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Electric Railway Journal, published monthly at New York, N. Y., for April 1, 1931.

State of New York } ss
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electric Railway Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 10th Ave. & 36th St., N. Y. C. Editor, John A. Miller, Jr., 10th Ave. & 36th St., N. Y. C. Managing Editor, None. Business Manager, Louis F. Stoll, 10th Ave. & 36th St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing company, Inc., 10th Ave. & 36th St., N. Y. C. Stockholders of which are: James H. McGraw, 10th Ave. & 36th St., N. Y. C. James H. McGraw, Jr., 10th Ave. & 36th St., N. Y. C. James H. McGraw, James H. McGraw, Jr., and Malcolm Muir, 10th Ave. & 36th St., N. Y. C., Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw. Curtis W. McGraw, 370 Seventh Ave., N. Y. C. Donald C. McGraw, 10th Ave. & 36th St., N. Y. C. Harold W. McGraw, 285 Madison Avenue, N. Y. C. Anne Hugus Britton, 10th Ave. & 36th St., N. Y. C. Mason Britton, 10th Ave. & 36th St., N. Y. C. Edgar Kobak, 10th Ave. & 36th St., N. Y. C. Grace W. Mehren, 2440 Lakeview Ave., Chicago, Ill. J. Malcolm Muir & Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 524 Fifth Ave., N. Y. C. F. S. Weatherby, 271 Clinton Road, Brookline, Mass. Midwood Corporation, Madison, N. J., Stockholders of which are: Edwin S. Wilsey, Madison, N. J. Elsa M. Wilsey, Madison, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

C. H. THOMPSON, Secretary
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 31st day of March, 1931.

[SEAL] H. E. BEIRNE.

Notary Public N. Y. Co. Clk's No. 203, Reg. No. 3B102. Kings Co. Clk's No. 636, Reg. No. 3129.
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he'll find that we'll make a most attractive offer for the complete system or any part of it! We specialize in the buying of surplus steam or electric railway equipment of any description—anywhere!

Where we buy your system in its entirety we dismantle. Our expert dismantling crew handles the work quickly and without trouble to you.

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ALPHABETICAL INDEX

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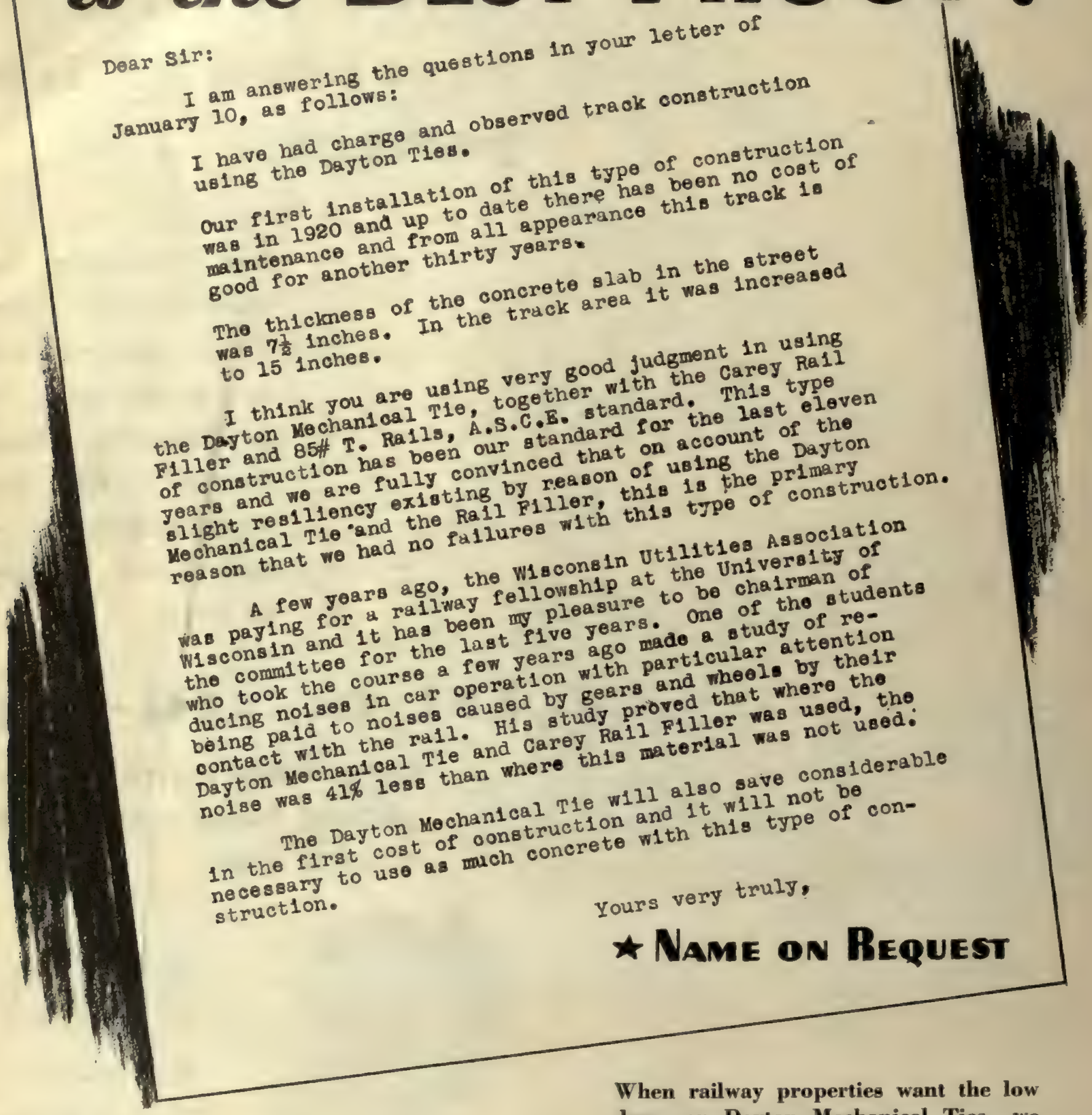


Dear Sir:

I am answering the questions in your letter of January 10, as follows:

I have had charge and observed track construction using the Dayton Ties.

Our first installation of this type of construction was in 1920 and up to date there has been no cost of maintenance and from all appearance this track is good for another thirty years.

The thickness of the concrete slab in the street was 7½ inches. In the track area it was increased to 15 inches.

I think you are using very good judgment in using the Dayton Mechanical Tie, together with the Carey Rail Filler and 85# T. Rails, A.S.C.E. standard. This type of construction has been our standard for the last eleven years and we are fully convinced that on account of the slight resiliency existing by reason of using the Dayton Mechanical Tie and the Rail Filler, this is the primary reason that we had no failures with this type of construction.

A few years ago, the Wisconsin Utilities Association was paying for a railway fellowship at the University of Wisconsin and it has been my pleasure to be chairman of the committee for the last five years. One of the students who took the course a few years ago made a study of reducing noises in car operation with particular attention being paid to noises caused by gears and wheels by their contact with the rail. His study proved that where the Dayton Mechanical Tie and Carey Rail Filler was used, the noise was 41% less than where this material was not used.

The Dayton Mechanical Tie will also save considerable in the first cost of construction and it will not be necessary to use as much concrete with this type of construction.

Yours very truly,

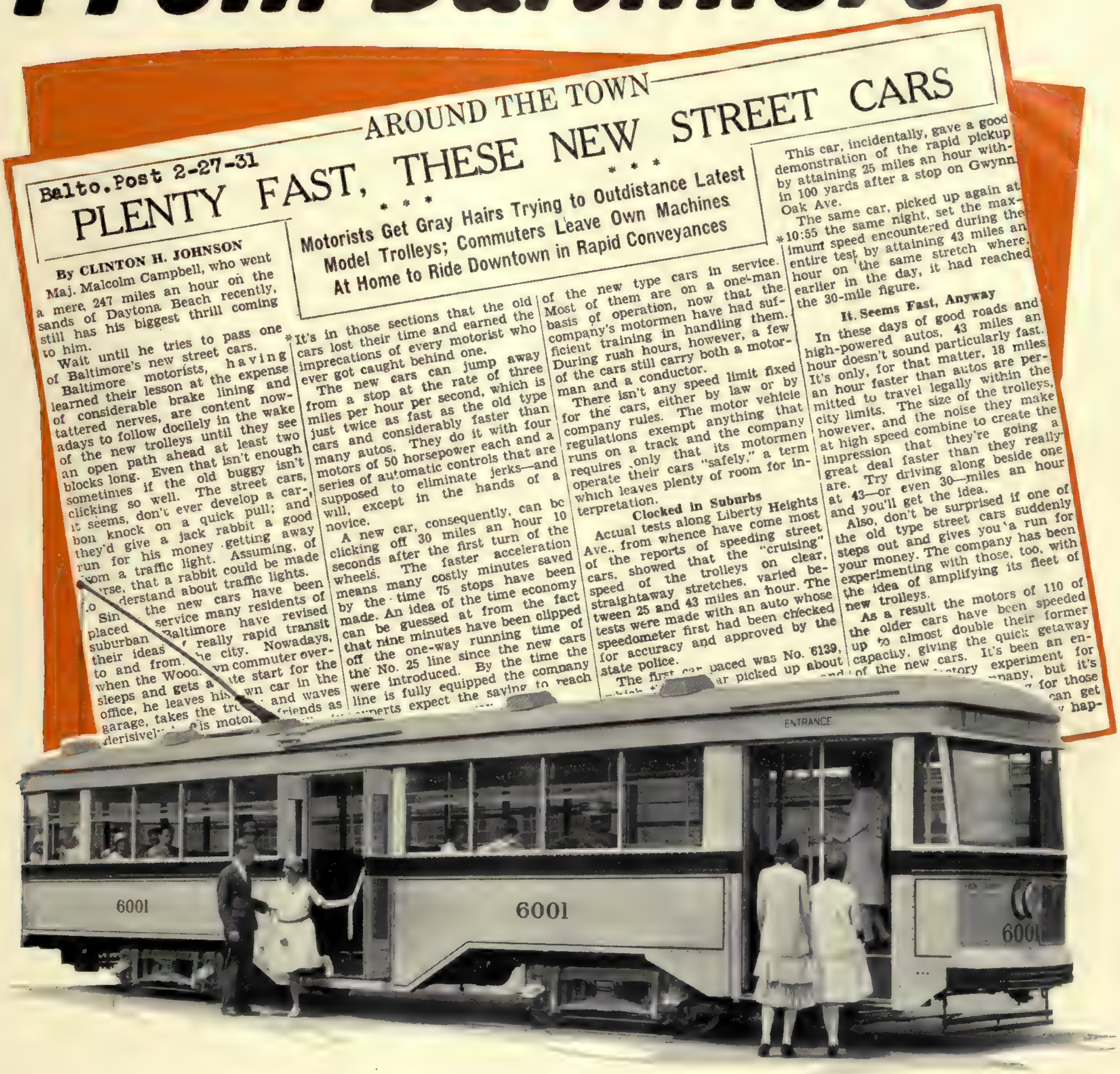
★ NAME ON REQUEST

When railway properties want the low down on Dayton Mechanical Ties—we are glad to refer them to other properties where they have been installed. The above letter is a typical example of the result of such correspondence. It constitutes voluntary evidence of the success of Dayton Tie Installations.

THE DAYTON MECHANICAL TIE CO.

DAYTON, OHIO

From Baltimore



Balto.Post 2-27-31

AROUND THE TOWN

PLENTY FAST, THESE NEW STREET CARS

* * *

Motorists Get Gray Hairs Trying to Outdistance Latest Model Trolleys; Commuters Leave Own Machines At Home to Ride Downtown in Rapid Conveyances

* * *

By CLINTON H. JOHNSON

Maj. Malcolm Campbell, who went a mere 247 miles an hour on the sands of Daytona Beach recently, still has his biggest thrill coming to him.

Wait until he tries to pass one of Baltimore's new street cars.

Baltimore motorists, having learned their lesson at the expense of considerable brake lining and tattered nerves, are content nowadays to follow docilely in the wake of the new trolleys until they see an open path ahead at least two blocks long. Even that isn't enough sometimes if the old buggy isn't clicking so well. The street cars, it seems, don't ever develop a carbon knock on a quick pull; and they'd give a jack rabbit a good run for his money getting away from a traffic light. Assuming, of course, that a rabbit could be made to understand about traffic lights.

Since the new cars have been placed in service many residents of suburban Baltimore have revised their ideas of really rapid transit to and from the city. Nowadays, when the Wood[illegible]wn commuter oversleeps and gets a late start for the office, he leaves his own car in the garage, takes the tro[illegible] and waves friends as [illegible] derisivel[illegible] is motor[illegible]

*It's in those sections that the old cars lost their time and earned the imprecations of every motorist who ever got caught behind one.

The new cars can jump away from a stop at the rate of three miles per hour per second, which is just twice as fast as the old type cars and considerably faster than many autos. They do it with four motors of 50 horsepower each and a series of automatic controls that are supposed to eliminate jerks—and will, except in the hands of a novice.

A new car, consequently, can be clicking off 30 miles an hour 10 seconds after the first turn of the wheels. The faster acceleration means many costly minutes saved by the time 75 stops have been made. An idea of the time economy can be guessed at from the fact that nine minutes have been clipped off the one-way running time of the No. 25 line since the new cars were introduced. By the time the line is fully equipped the company [illegible]xperts expect the saving to reach [illegible]

of the new type cars in service. Most of them are on a one-man basis of operation, now that the company's motormen have had sufficient training in handling them. During rush hours, however, a few of the cars still carry both a motorman and a conductor.

There isn't any speed limit fixed for the cars, either by law or by company rules. The motor vehicle regulations exempt anything that runs on a track and the company requires only that its motormen operate their cars "safely," a term which leaves plenty of room for interpretation.

Clocked in Suburbs

Actual tests along Liberty Heights Ave., from whence have come most of the reports of speeding street cars, showed that the "cruising" speed of the trolleys on clear, straightaway stretches, varied between 25 and 43 miles an hour. The tests were made with an auto whose speedometer first had been checked for accuracy and approved by the state police.

The first car paced was No. 6139, [illegible]ar picked up about [illegible]

This car, incidentally, gave a good demonstration of the rapid pickup by attaining 25 miles an hour within 100 yards after a stop on Gwynn Oak Ave.

The same car, picked up again at *10:55 the same night, set the maximum speed encountered during the entire test by attaining 43 miles an hour on the same stretch where, earlier in the day, it had reached the 30-mile figure.

It Seems Fast, Anyway

In these days of good roads and high-powered autos, 43 miles an hour doesn't sound particularly fast. It's only, for that matter, 18 miles an hour faster than autos are permitted to travel legally within the city limits. The size of the trolleys, however, and the noise they make at high speed combine to create the impression that they're going a great deal faster than they really are. Try driving along beside one at 43—or even 30—miles an hour and you'll get the idea.

Also, don't be surprised if one of the old type street cars suddenly steps out and gives you a run for your money. The company has been experimenting with those, too, with the idea of amplifying its fleet of new trolleys.

As a result the motors of 110 of the older cars have been speeded up to almost double their former capacity, giving the quick getaway of the new cars. It's been an en-[illegible]tory experiment for [illegible]pany, but it's [illegible] for those [illegible] can get [illegible] hap-

Brill Modern Cars Speed up Service

"Plenty fast" means ability to at least keep abreast of other street traffic. It means public patronage in this age of speed, and public patronage means increased revenue. New Brill Modern Cars are popular because they're attractive in appearance, comfort and speed—in keeping with the present day idea of modern transportation.

What Mr. Johnson says about Baltimore's new cars might just as easily be said of those in other cities.

THE J. G. BRILL COMPANY
PHILADELPHIA

CHICAGO OFFICE - HARRIS TRUST BUILDING
SAN FRANCISCO OFFICE - RIALTO BUILDING
THE J. G. BRILL COMPANY OF OHIO - CLEVELAND
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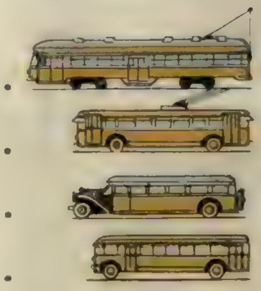


street cars . . .
trolley buses . . .
gas-mechanical buses . . .
gas-electric buses . . .

TIMKEN AXLES

FRONT *and* WORM-DRIVE REAR

THE TIMKEN DETROIT AXLE CO.
DETROIT MICHIGAN

JUNE, 1931

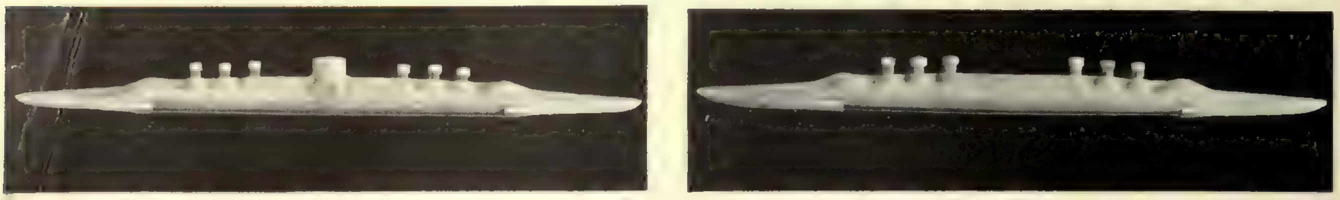
ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc. Thirty-five Cents Per Copy

The most widely copied coach design in America today . . . unchanged through four years of service except for detail refinements. Sales up to June first are fifteen per cent greater than for the same period last year.

Twin Coach
BY F.R. FAGEOL KENT, OHIO

NEW Trolley Wire Splicer

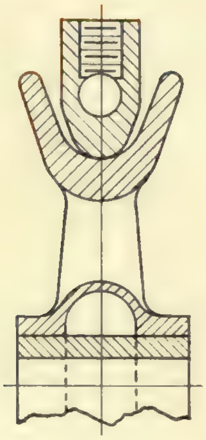


The New Westinghouse type NL Light-weight Trolley Wire Splicer (left) with boss, (right) without boss.

Light Weight

Less Side Wear

Reduced Arcing



Cross section showing how the new Westinghouse Light-weight Splicer rides in the bottom of groove in the trolley wheel.

AFTER careful engineering study and research, Westinghouse engineers have designed and perfected a new light-weight, six set-screw trolley wire splicer, known as the type NL.

The design of this new splicer permits a width which gives maximum wheel clearance, thereby reducing side wear to a minimum. The narrow body, which comes to a rounded point at the bottom, allows the splicer to ride on the bottom of the groove in the trolley wheel. Wear is confined almost entirely to rolling friction.

The lips of the splicer are cast in such a way that when peened around the wire, they conform to the shape of the body of the splicer. This eliminates any bumping between the lips and the body. A smooth approach results from the tapered lips and the sides that are ground to a knife edge at the end.

Arcing and burning are reduced to a minimum by the smooth approach and under-run that is almost as smooth as plain wire. The complete transition takes place on a straight line.

The new type NL trolley wire splicer is made for all sizes of wire from 2-0 to 4-0, round and grooved. It can be furnished with or without boss.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

WESTINGHOUSE ELECTRIC

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Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Vol. 75, No. 6 John A. Miller, Jr., *Editor* *Pages 285-340*

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Chicago
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What a Banker Thinks About Electric Railway Problems

By
FRANCIS H. SISSON
Vice-President
Guaranty Trust Company
New York, N. Y.

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1931

Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérét local et de Transports Publics Automobiles.

New York, *District Office, 285 Madison Avenue*
Washington, *National Press Building*
Chicago, *520 North Michigan Avenue*
Philadelphia, *1600 Arch Street*
Cleveland, *501 Guardian Building*
Boston, *1427 Statler Building*
Greenville, S. C., *1301 Woodside Building*
Detroit, *2-257 General Motors Building*
St. Louis, *1556 Bell Telephone Building*
San Francisco, *883 Mission Street*
Los Angeles, *632 Chamber of Commerce Bldg.*
London, *Aldwych House, Aldwych, London, W.C.2*

Published monthly, with one additional Convention Number during the year. $3 per year, 35 cents per copy. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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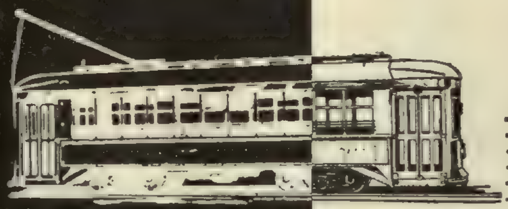
Making Cars Move in the Tempo of the Times



Present-day transportation vehicles must move with speed and safety. Adequate and effective brake control is vital. In every class of electric railway service air brakes have met the widely-varying needs . . . The flitting street car, the speeding interurban, the clattering elevated, the rushing subway, the nimble trolley bus—are all able to move in the tempo of the times because of effective brakes, modernized and adapted to a specific purpose—air brakes, complete from compressor to brake cylinder, made by the WESTINGHOUSE TRACTION BRAKE CO., General Office and Works, Wilmerding, Pa. » » » » » »

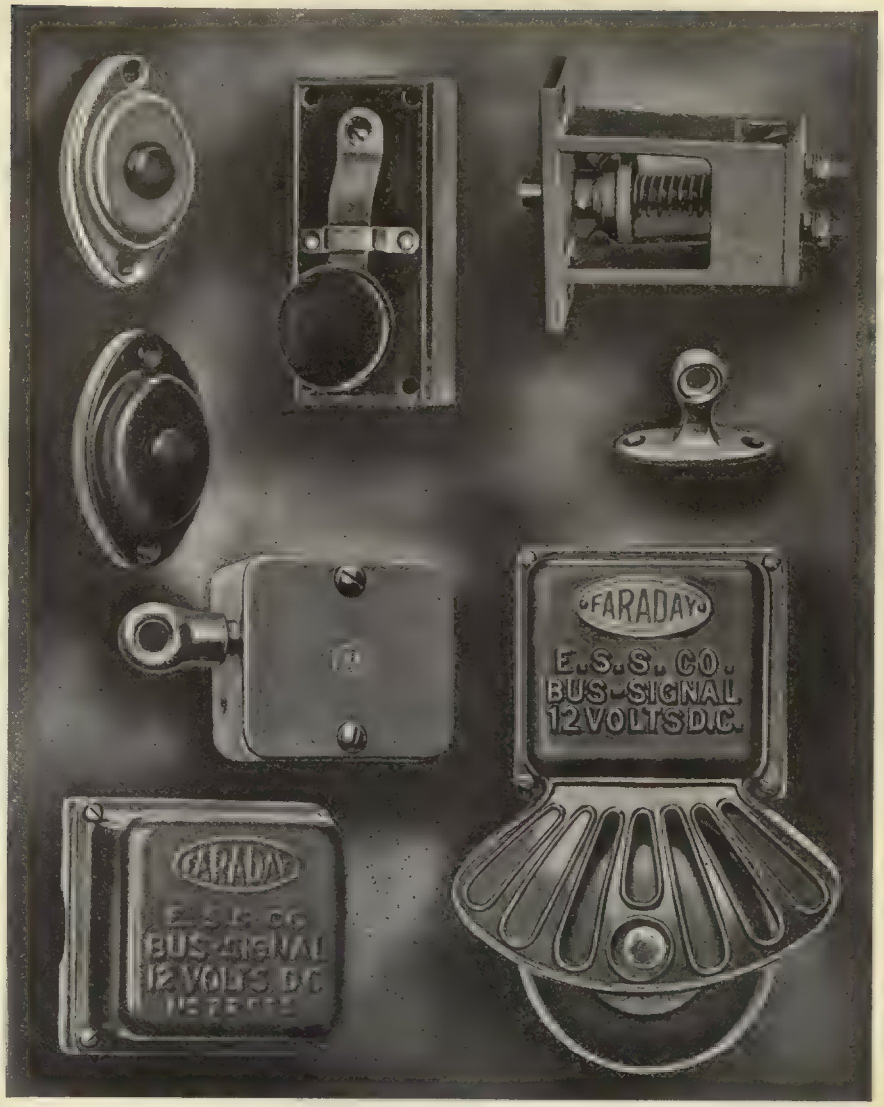
WESTINGHOUSE TRACTION BRAKES

Nothing short of HEAVY DUTY *will do!*

Transportation of any kind imposes severe punishment on rolling stock and equipment. It *pays* to buy *extra* strength, *extra* endurance and *longer* service in the specialties you use.

Faraday Signal Systems are typical of E. S. S. CO. products. They are built for constant service and are as sturdy and dependable as it is possible to make them.

Our catalog should be in your files. If it isn't—send for it now and use it profitably.



Faraday Signal Systems are supplied in high and low voltage types for cars and buses. The Faraday line consists of bells, buzzers, pull switches, door switches, pushes, cord guides and other allied material.

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

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KEYSTONE SPECIALTIES

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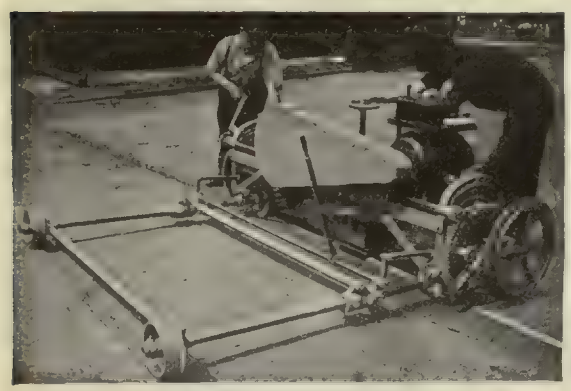
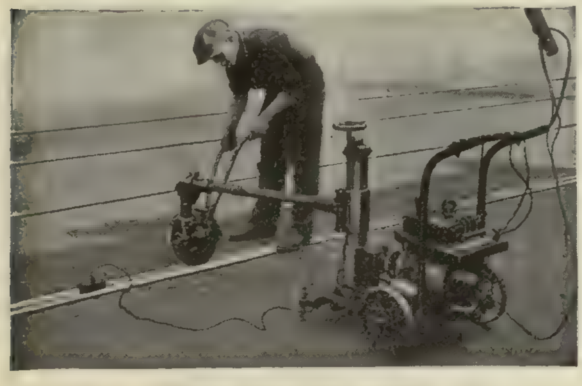
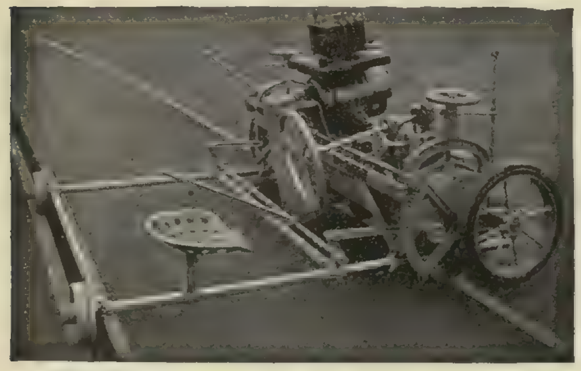


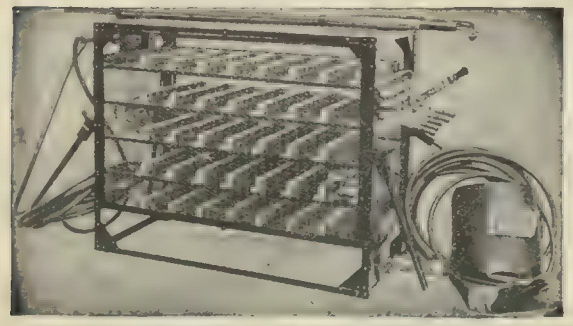
Vulcan Rail Grinder



Eureka Radial Rail Grinder



Improved Atlas Rail Grinder



Ajax Electric Arc Welder

Going
to stay
in business?

Does your rail look it?

Arc welding and grinding show confidence in the future, build business in the present, save maintenance cost always.

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5538

5674 STREET CARS — 9228 TREADLES

998 BUSES — 998 TREADLES

137 TROLLEY BUSES — 137 TREADLES

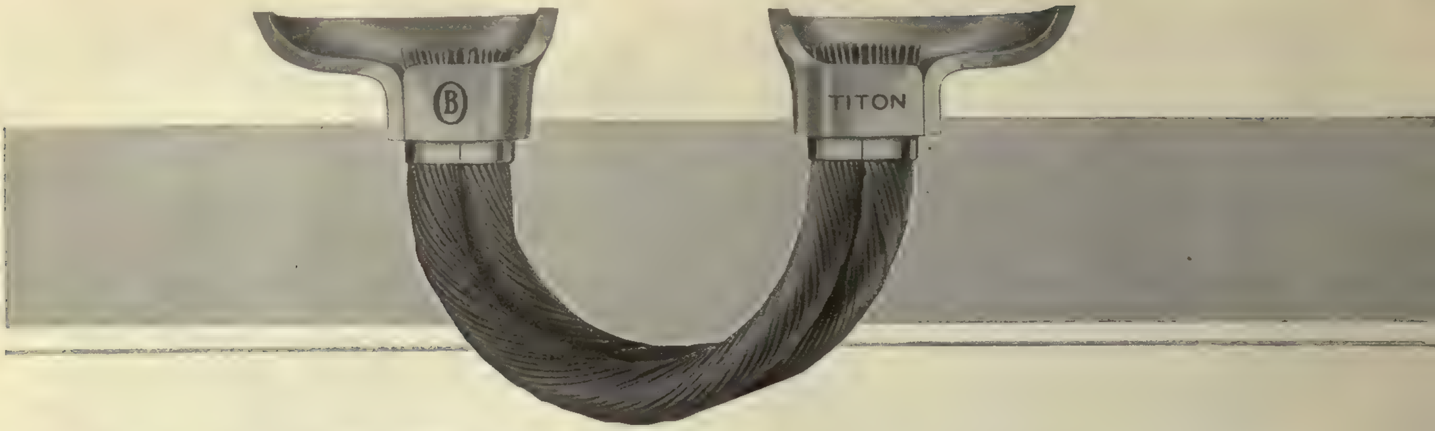
10,363 . . . NP Treadle

Doors in service today

The large number of National Pneumatic Treadle Doors in service today is indeed a tribute to the efficiency of this device in effecting the circulating load and thus promoting economical, fast and *safe* service in one-man operation. It will pay you to investigate.

NP

NATIONAL PNEUMATIC COMPANY



There is a profitable relation between

QUICKENED CAR SCHEDULES *and* TRACK RETURN CIRCUITS

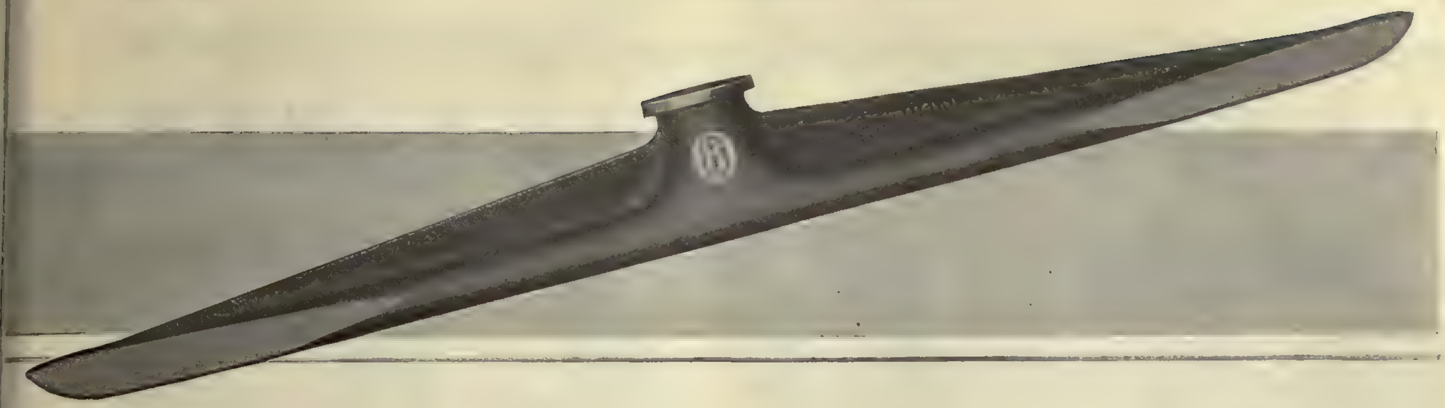
O-B Titon Bonds require only a one-inch space alongside the rail for application.

MANY properties have been able to quicken car schedules and patronage by improving track-return circuits. This practice has been profitable because the expense is nearly negligible. Not only does it bring returns in increased public good-will, but it saves power otherwise wasted through current leakage at worn, loose, or improperly applied rail bonds. Furthermore, it saves the expense of re-winding burnt out armatures on the motor equipment.

Securing and maintaining efficient track-return circuits is made easier and more certain with O-B Titon Bonds. Applied by the copper metallic-arc process with Duron Welding Rod, Titon Bonds provide a continuous, highly conductive copper path from one rail to another. The welds are practically pure copper and are dense, non-porous, and of high tenacity.

Titon Bonds are easily and quickly installed. The terminal construction makes molding equipment unnecessary, and the bonds require only a one-inch space alongside the rail for application. Exceptional welding skill is not required as welding is accomplished by striking the arc and filling the terminals with the molten Duron Rod.

The installation of a few Titon Bonds well demonstrates their low cost of application as well as their high efficiency and durability. Ordering information is given on page 667 of O-B Catalog No. 20.



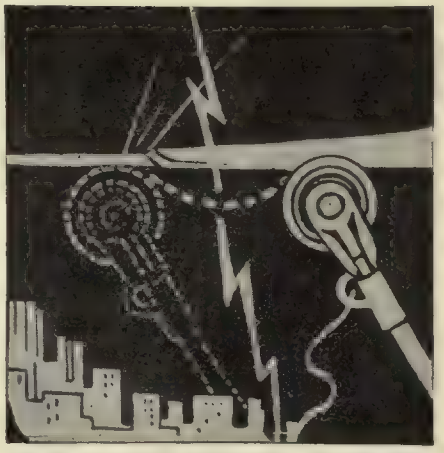
In your trolley ears, eliminate the

CAUSE *of* BATTERING *and* BURNING --- EFFECT NOTICEABLE COST REDUCTIONS

EXCEPT in unusual installations, friction contributes but a small part to the necessity for frequent trolley ear renewals when compared with the battering and burning action involved. When the causes for battering and burning are minimized by proper ear design, the life of the ear is measurably increased and costs are correspondingly reduced.

The long life of the *Improved* Marathon Ear is due to the great improvement in its tapered approach and its smoother underrun. There are no blunt ends for the flanges of the wheel to batter and strike against. The lips of the *Improved* Marathon gradually increase from knife-edge thinness at their ends to generous thickness at the boss-section which provides a smooth, even path for the wheel. Thus have the principal causes for battering and burning been eliminated with a consequent important increase in the number of wheel passes obtained.

The use of *Improved* Marathon ears secures not only a reduction in ear cost but in the cost of trolley wheel and wire maintenance as well. Wheels last longer and wire life is appreciably increased as the natural result of the elimination of excessive battering and burning.



By eliminating the causes of battering and burning, ***Improved*** *Marathon Ears add appreciably to the life of wheels, wire and ears.*

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Company Limited, Niagara Falls, Canada

1421BL

Ohio Brass Co.

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ANNOUNCING THE NEW

1½ TON REO

By actual comparison the new SPEED WAGONS surpass all commercial vehicles in the lowest price 1½-ton field!

Equipped with heavy, powerful truck type 4 or 6 cylinder engines!—each having *more* bearings and *larger* bearings than any competitive engine! And Reo's maximum piston displacements give abundant power!

The REO cylinder blocks are cast of chrome nickel iron, actually 7 *times longer wearing* than the usual grey iron! Pressure lubrication forces oil constantly to all vital engine parts, *even to the piston pins!* Frames in the new SPEED WAGONS are 7″ deep! The brakes are *hydraulic*, fully enclosed, weatherproof, safe!

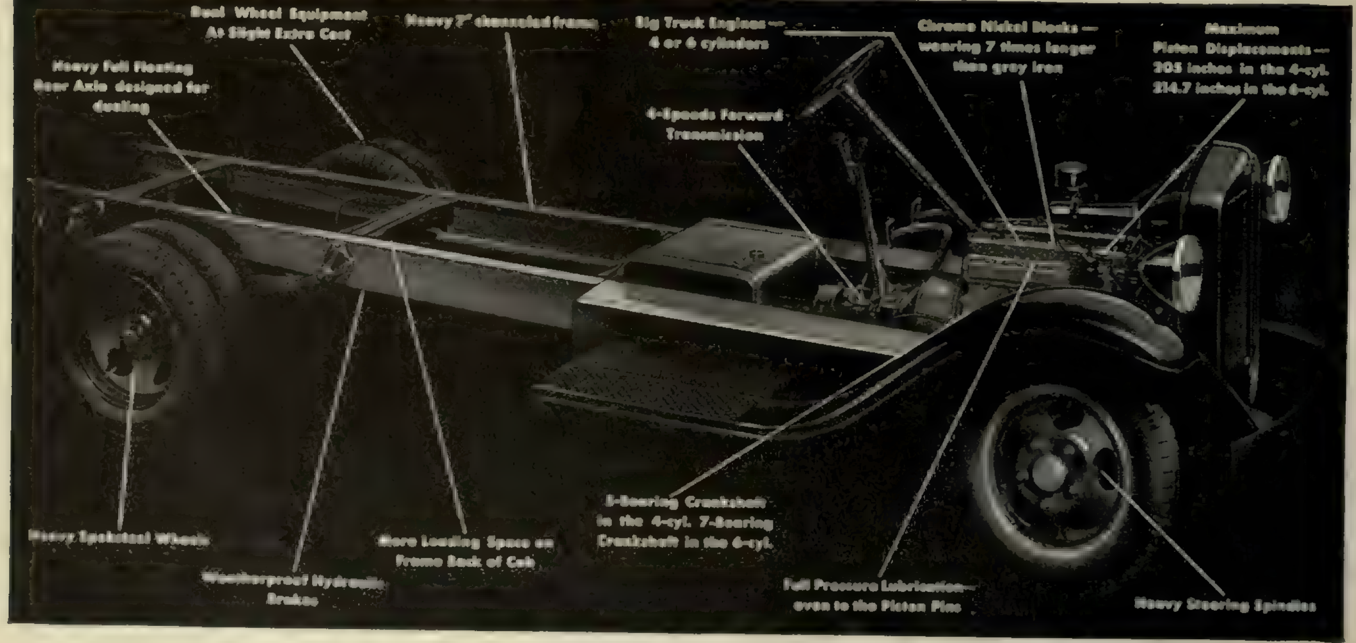
Compare specifications with REO'S. *Drive* the new *SPEED WAGONS.* Load them with your own loads—test them on your own particular haulage routes. Then you will realize that these remarkable new trucks truly uphold the finest of Reo traditions—*quality throughout.*

SPEED WAGON

$625

Four-Cylinder $625, Six-Cylinder $725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

REO MOTOR CAR COMPANY, LANSING · TORONTO


Dual Wheel Equipment At Slight Extra Cost
Heavy 7″ channeled frame
Big Truck Engines — 4 or 6 cylinders
Chrome Nickel Blocks — wearing 7 times longer than grey iron
Maximum Piston Displacements — 205 inches in the 4-cyl. 214.7 inches in the 6-cyl.
Heavy Full Floating Rear Axle designed for dualing
4-Speeds Forward Transmission
Heavy Spokated Wheels
Weatherproof Hydraulic Brakes
More Loading Space on Frame Back of Cab
5-Bearing Crankshaft in the 4-cyl. 7-Bearing Crankshaft in the 6-cyl.
Full Pressure Lubrication — even to the Piston Pins
Heavy Steering Spindles

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THE MODERN STEEL WHEEL THAT NEEDS NO MAINTENANCE

LIGHT WEIGHT—

Due to its special composition steel the Davis Wheel can be made lighter in weight without sacrifice of strength.

STRENGTH—

Heat treatment develops in each part of the Davis Wheel precisely the characteristics needed to best fit it for work to be done.

ONE-WEAR—

Special composition steel and triple heat treatment provide unique qualities that make the Davis Wheel truly "One-Wear."

ASF

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

EXPERIENCE

25
YEARS

Any product, or process, no matter how simple, is subject to many problems and difficulties in the early years of its development. Any organization requires time to secure the respect and confidence of its prospective clients. With more than a quarter of a century back of it, the Metal & Thermit Corporation has been able to develop its product, Thermit, and its process of rail welding to the highest possible efficiency. Although basically, the material is the same as introduced in 1905, Thermit has been greatly improved by better control of raw materials and process of manufacture, thus insuring the best possible product with absolute uniformity. Likewise the method of Thermit Welding has been perfected and as well as greatly simplified.

The
METAL & THERMIT
CORPORATION
120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So.San Francisco Toronto

THERMIT

150
PROPERTIES

One hundred and fifty users, including most of the largest and best-known railways, *can't be wrong.* These companies have competent and experienced engineers. They carefully studied the actual performance records of Thermit-welded rail joints, before committing their companies to the investment of money in extensive track reconstruction programs with Thermit welds . . . . Name the railway in any one of the larger cities and you will probably name a Thermit-user. Name offhand, any ten medium-sized and small companies you happen to think of and you're sure to include several regular Thermit users. Name the eight electric railways which have won the Annual Coffin Award and you'll name six who weld with Thermit.

The
METAL & THERMIT
CORPORATION
120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So.San Francisco Toronto

THERMIT

. . . COUNTS!

1,000,000 JOINTS

Approximately a million joints have been made on American electric railway lines by the Thermit process—600,000 of them in the last ten years. The Thermit Insert type of weld has been the standard of the Metal & Thermit Corporation since 1912, that is, for nearly twenty years. It is safe to say that nearly all the Thermit Insert Welds, installed since 1912 are still in service unless the track itself has been worn out or removed for other reasons. Ten years ago the present center-pour method was adopted, making the Thermit Weld better, more economical and easier to install. Recently we have perfected a still further advance in the art—*welding under traffic*,—thereby overcoming one of the last objections to the use of Thermit rail welding.

The
METAL & THERMIT CORPORATION
120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So.San Francisco Toronto

THERMIT

50% LOWER COST

From the very first, most railway men appreciated the inherent merit of the process, but cost was usually the stumbling block in the earlier days. By improvements in methods of installation, by reduction in the amount of Thermit required, and by production of Thermit itself at a lower cost, we have been able to pass along to the consumer progressively lower costs. Today it is actually about 50% less than even ten years ago . . . . We think these are significant statistics . . . . 25 years in business . . . . Selling Thermit to 150 railway companies . . . . 1,000,000 joints installed . . . .50% lower cost . . . . Statistics which explain the respect and confidence this company enjoys in the industry. Statistics which indicate that *experience counts.*

The
METAL & THERMIT CORPORATION
120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So.San Francisco Toronto

THERMIT

BALTIMORE ★ BROOKLYN ★ LONG BEACH ★ DES MOINES ★ MILWAUKEE ★ DAYTON ★ BALTIMORE ★

To Meet Modern Requirements These Cities Have Recently Selected G-E Equipment

BALTIMORE—The new G-E equipped cars glide away from a stop smoothly at the rate of 3.25 mphps. — just twice as fast as the old-type cars. They are part of the fastest fleet of street cars in city service in the United States.

BROOKLYN—In dense traffic, it is almost imperative that street cars be able to accelerate faster than automobiles and trucks. To meet schedule requirements, the new G-E equipped cars in Brooklyn are designed to accelerate at the rate of 3 mphps.

LONG BEACH—Here, and in San Bernardino, (Calif.) car riders have found that the new light-weight street cars move faster in traffic than automobiles and are equally comfortable.

DES MOINES—The new G-E equipped street cars not only permit one-man operation with safety, but they have improved schedule speeds and have made car riding much more attractive.

MILWAUKEE—The new two-car, three-truck articulated units are equipped with six GE-301 motors and modified Type K control. They are thoroughly capable of handling the heavy peak loads in the industrial district.

DAYTON — The fastest light-weight interurban cars in the world are now operating on a 225-mile run between Cincinnati and Toledo. They leave competing buses one hour behind on a route 15 miles longer. The attractiveness of this new service has resulted in increased patronage all along the route.

330-166

GENERAL ELECTRIC

BROOKLYN ★ LONG BEACH ★ DAYTON ★

★ DES MOINES ★ MILWAUKEE ★ BROOKLYN ★

ELECTRIC RAILWAY JOURNAL

New York,
June, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 6

How Is Business?

FEELING the pulse of business, taking its temperature, and applying a stethoscope to test its heart action, has lately become a great national pastime. That this should be so is not surprising, since the state of business and industry is a matter of vital concern to nearly everyone. All this anxious examination of the invalid's condition increases the general feeling of uncertainty and tends to emphasize every unfavorable symptom, but in spite of that the situation begins to show some signs of getting better.

Marked improvement in the local transportation industry cannot be expected until general business activity becomes more nearly normal. Just when this will occur no one can say. It is significant, however, that recent earnings of electric railway and bus operating companies compare more favorably with the corresponding figures for last year than did the earnings of a few months ago. Nor is this simply because the earnings of a year ago were extremely low. Measured in actual dollars and cents, the latest revenue reports show sign of improvement. Moreover, there seems every reason to expect that this improvement will continue—slowly perhaps, but none the less surely.

▼

New Regime Starts Auspiciously at Philadelphia

PROSPECTS of long-drawn-out litigation over the question of the receivership of the Philadelphia Rapid Transit Company have been removed by the offer of Mitten Management to withdraw. In making this offer, it acted wisely. That it might eventually have been forced out is beside the point. Had it elected to contest the issue, time and attention would have been diverted from the orderly conduct of the affairs of the company. This time and attention can now be applied constructively.

The new regime starts auspiciously. Its responsibilities are great. But the composition of the board gives promise that the members will be equal to the task. Their apparent plan is to leave undisturbed an operating personnel that has functioned well and has the confidence of the rank and file. To be retained and fostered are those features of the relations with the employees that have made for peace among them as participants in the affairs of the company.

Many intricate matters, however, remain to be considered. So that the board may go into them well informed, surveys are to be made within the organization as a guide to reaching decisions for the future. The new management deserves public support. But it will continue to deserve it only so far as it rises to the stupendous task of meeting the obligation with which it is charged.

▼

Mass Education Concerning Mass Transportation

NOTABLE progress was made at the recent meeting of the United States Chamber of Commerce in directing the attention of business men to the important part which mass transportation plays in the daily life of commerce and industry. Discussion of this subject occurred at a well-attended round-table luncheon conference. Facts that have long been familiar to transportation men were eloquently presented to the assembled merchants and manufacturers, to whom many of these facts were new. It was pointed out that the small decrease which has occurred during recent years in the number of passengers carried on the electric railways has been in non-necessity riding, while necessity riding in the rush hours has increased. In other words, the service is constantly becoming more essential, at the same time that greater difficulties are being experienced in making it pay its way. That sufficient street space can never be provided to accommodate everyone in private automobiles was clearly brought out. If mass transportation service is to be preserved, however, some way must be found to put it on a firm financial basis.

From the remarks of the business men present at this conference, it was evident that they were much impressed with the importance of finding a solution of the community transportation problem. No attempt was made at the meeting to develop any definite program of action. As a preliminary step, however, it was suggested by one of the business men that the transportation industry should undertake a campaign of mass education. This is easier said than done. It is necessary to proceed carefully with such a plan to avoid the appearance of propaganda.

The frank discussion which took place at the Chamber of Commerce meeting was a step in the right direction. The resolution to appoint a committee for the study of the problem was another important step. Individual railways can profitably adopt the plan of discussing their problems with the business men of their own communities. The leaders of American commerce and industry must be brought to a full realization of what mass transportation means to them in the conduct of their own affairs. This will not be accomplished over night, but it is encouraging to note that real progress is being made toward that goal.

▼

Battle Over One-Man Cars Shifts from Yonkers to Atlanta

DISMISSAL by the New York Public Service Commission of the complaint recently made by the city of Yonkers against the operation of one-man cars is the latest of a number of significant decisions upholding the use of such vehicles. More than a year ago the United States Court for the Western District of Louisiana found that "in the light of proved experience" the refusal of the city of Shreveport to permit the operation of one-man cars was arbitrary and equivalent to taking the railway company's property without due process of law. The court therefore enjoined the enforcement of the ordinance. A few weeks ago a searching investigation by the St. Louis Public Safety Council resulted in emphatic indorsement of one-man operation. Wherever the question has been fairly studied the conclusion has been reached that street cars can be operated as safely with one man as with two.

Curiously enough, the announcement of the decision in the Yonkers case came almost simultaneously with the passage of an ordinance in Atlanta, Ga., forbidding the operation of one-man cars within the fire limits of that city. The usual explanation was made that this was being done in the interest of safety. Since nothing had been brought out to show that one-man operation in Atlanta involved greater hazards than exist elsewhere, this explanation appears extremely thin. One is much more inclined to believe with President Arkwright of the Georgia Power Company that the move was made to force treating with electrical workers of an associated company who are now out on strike.

Whether or not the plea of safety was sincere, it is rank discrimination to require the presence of two men on a street car when thousands of one-man automobiles are allowed to operate on the public streets without hindrance. A street railway has the same right as any one else to conduct its business as economically as possible. To compel it to carry men on its payroll when they are not necessary is manifestly unjust. As Judge Dawkins pointed out in the Shreveport case, it is equivalent to taking the company's property without due process of law. Equity and common sense may be disregarded by city officials in their desire to harass the street railway, but courts take into account facts that councils frequently ignore in their excess of zeal.

▼

Unique Exhibit Opportunity at 50th A. E. R. A. Convention

SELDOM will manufacturers have such an opportunity for an interesting and instructive convention exhibit as that presented by the golden anniversary gathering of the American Electric Railway Association at Atlantic City next September. Since there was no exhibit at the San Francisco convention last year, the delegates will be unusually keen to look over the new products. Reasonable hope exists that general business conditions will have improved before the end of the summer and a large attendance is expected. During the past eighteen months purchases of equipment have been held down to a minimum. If the sky brightens before September, the railways are likely to be in a buying mood. These facts alone would justify the manufacturers in making special efforts to have a good exhibit.

An additional reason, however, is the unique character of this year's convention—the 50th anniversary of the association. Some of the manufacturers have been exhibitors since the early conventions. Others have come into the fold comparatively recently. But all have played their parts in the industry's development. They may justly take pride in what they have done, and can well afford to emphasize it in their exhibits. Wherever it can be done effectively, it would be desirable to have displays of a historical character. While everyone is concerned primarily with the problems of the present, no one is too busy to give a thought to the long process of development which has placed the industry where it is today. The manufacturer who has an exhibit showing his past contributions to the industry's progress, as well as the products which he has developed to meet the problems of the present and the future, cannot fail to make a deep and lasting impression upon the mind of every delegate.

▼

Profit Sharing as a Means of Encouraging Employee Co-operation

UNUSUAL interest attaches to the plan recently inaugurated by the Kansas City Public Service Company wherein the employees share to the extent of 25 per cent in the net income. Details of the plan are given in an article appearing elsewhere in this issue. Nothing quite like the plan has been tried before in the local transportation industry. While opinions may differ as to its general applicability, it appears to work well in

Kansas City. There the interest of the employees has been aroused in operating the property more efficiently; there the employees have been awakened to the importance of effecting every possible economy. Evidence of this is found in the figures. During the first three months of this year the Kansas City company was able to place nearly $40,000 to the credit of its employees. At the same time, the amount available for dividends to stockholders was approximately the same as that available during the first three months of last year, before the profit-sharing plan was in effect.

Some economists hold that it is unsound to give the employees a share in the profits when they do not share in the risks of the business. Undoubtedly, there is a certain logic in that contention. But such a view considers only the financial side of the question. In reality, every employee participates to a considerable extent in the risks of the business, even though he has not a cent invested. If a greater measure of employee co-operation can be secured through a profit-sharing scheme of this kind, its adoption would appear to merit careful consideration regardless of academic arguments against the theory upon which it is based. Certainly, the industry will watch with interest the further results of its operation at Kansas City.

▼

Must the Evils of Competition Be Experienced to Be Understood?

CHICKENS are coming home to roost to those newspapers that have given vent to expressions of opinion that competition in transporting is not the dreadful thing the transportation interests have contended. Newspapers do compete among themselves, but the specter that scares them now is the prospect of news broadcasts by radio, to say nothing about the effect of advertising campaigns broadcast by radio.

At the recent convention of newspaper proprietors many had goose flesh at the prospect. Resolutions offered testify to the degree of panic which characterized the meeting. Columns were given to the matter as if it were of great public concern. Attention is called to the matter not to belittle the importance of the daily newspaper, but merely to point out the difference in attitude upon the part of some papers in their handling of a matter in which their own interests appear to be threatened and one in which the interests of others are concerned.

Little cognizance appears to have been taken by the publishers of the fact that both the radio and the newspaper have their distinctive fields, just as in transportation the trucks, the buses, the airplanes, the electric railways, the pipe lines and the railroads have their distinctive fields.

The charge was made that the newspapers have lost $11,000,000 in advertising to the radio but, according to President Aylesworth of the National Broadcasting Company, the radio has spent $31,000,000 in newspaper advertising, "which makes the newspapers ahead by $20,000,000." If radio stations are usurping the functions of the newspapers and items are being broadcast that tend to destroy the surprise value of the printed page, is that any worse for the newspapers than for the organized transportation agencies, strictly regulated, to have to meet competition that in most cases is not on a basis that makes for fair competition among the carriers? This used to be a purely hypothetical question for the papers. And they didn't always answer it in the way it should be answered. Perhaps, since the problem has now been brought home to them direct, the minds of newspaper editors will be penetrated by rays of reason not set into action by purely academic considerations. Evidence from the newspapers in their future comment on transportation topics of better logic and more light is expectantly awaited.

▼

Advantages of Automatic Schedule Checking

EVERY available means of increasing operating speeds must be used if transportation service is to meet present-day demands. Better mechanical equipment is an important factor in accomplishing this result. Better utilization of the equipment, however, frequently offers an opportunity that is equally as great. In this connection, the use of headway recorders and automatic schedule checkers has proved extremely advantageous on a number of systems. As a result of the information supplied, speed has been increased and the quality of service improved.

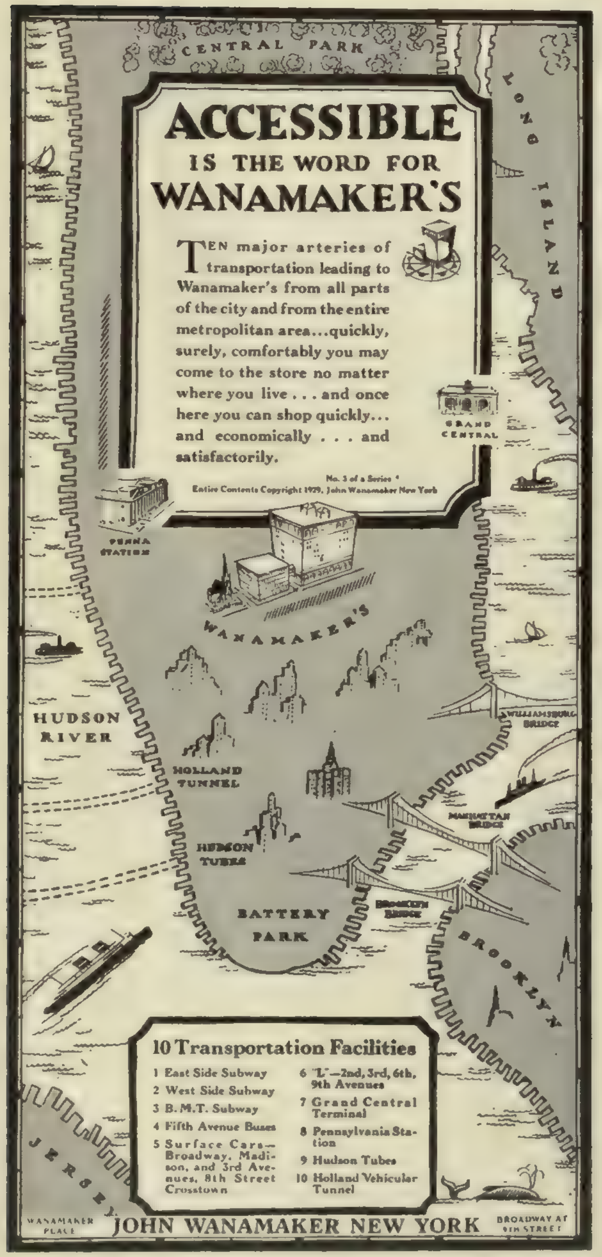
Several methods have been developed for this purpose. Toronto has installed headway recorders at seven divisional offices to check the regularity of its service. Pittsburgh has an elaborate system of recording visually and on paper the movements of all cars. Brooklyn recently completed the installation of its "headwaygraph," which records the service at 47 points on its 42 lines giving instantaneous information as to the positions of the cars. And Salt Lake City has developed an arrangement described elsewhere in this issue, which records both the service rendered and the service scheduled, giving an immediate and constant check of each individual car.

Headway recorders and schedule checkers give valuable information for revising schedules, discourage operators from running ahead of schedule, aid in checking causes of delay, disclose trainmen who are not reporting delays, identify operators who are careless about time-tables, eliminate the personal factor in checking the men, and have a valuable psychological effect of encouraging the trainmen to render dependable service. In consideration of these advantages and the fact that the installation usually is paid for in a short period out of the savings effected, it is likely that their use will become increasingly popular.

RETAIL STORES Must Have *Adequate Transportation Facilities*

By
JOSEPH H. APPEL
of John Wanamaker
New York

Convenience of access is most important element in selection of a store site. Since a large majority of customers use public transportation, the best location is that which is best served by these agencies



ACCESSIBLE
IS THE WORD FOR
WANAMAKER'S

TEN major arteries of transportation leading to Wanamaker's from all parts of the city and from the entire metropolitan area...quickly, surely, comfortably you may come to the store no matter where you live . . . and once here you can shop quickly... and economically . . . and satisfactorily.

No. 3 of a Series
Entire Contents Copyright 1929, John Wanamaker New York

10 Transportation Facilities

1 East Side Subway
2 West Side Subway
3 B.M.T. Subway
4 Fifth Avenue Buses
5 Surface Cars—Broadway, Madison, and 3rd Avenues, 8th Street Crosstown
6 "L"—2nd, 3rd, 6th, 9th Avenues
7 Grand Central Terminal
8 Pennsylvania Station
9 Hudson Tubes
10 Holland Vehicular Tunnel

WANAMAKER PLACE
JOHN WANAMAKER NEW YORK
BROADWAY AT 9TH STREET

Accessibility, made possible by ten transportation facilities, is stressed in this unusual advertisement

FORESEEING that some time in the future ships of the air might make port on the tops of high buildings, Wanamaker's successfully launched a balloon from the roof of the New York store as long ago as the summer of 1911. People said it was a publicity stunt, but today there is a mooring mast atop the tallest building in New York—the Empire State—and autogiros are landing on the White House grounds and other small lawns. Delivering parcels by airplane, dropping them on board a departing ship, sending them quickly to remote points, bringing fashions of the day from Paris by airplane to arrive almost at the moment of their creation, bringing a grand piano from Germany by the "Graf Zeppelin," co-operation with Glenn Curtiss in the building of an airplane capable of flying across the Atlantic Ocean—these are some of the recent achievements in air transportation in which Wanamaker's has participated. Yet, probably the greatest achievement of all was the decision of John Wanamaker in 1907 to retain the location of his New York store at Astor Place, where public transportation facilities, both present and contemplated, make the site practically the center of the metropolitan shopping district.

This decision was made with the clear recognition that a store can receive the maximum number of customers only when it is served adequately by mass transportation agencies. Although many patrons come to a store by private automobile, the great majority arrive by public carriers. This is particularly true in a metropolitan city, such as New York, because of the amount of traffic congestion. Without adequate mass transportation facilities, Wanamaker's, or any other large department store in New York City, would be tremendously handicapped in its endeavor to obtain its rightful share of the retail business. One need only to observe the thousands of persons who every hour leave the subway trains and surface cars at the Wanamaker location and hurry into the store to be convinced of this fact. Adequate public transportation is, without question, one of the merchants' vital necessities for attaining success in storekeeping.

More than a dozen major transportation facilities lead directly to Wanamaker's, tapping the home districts north, east, south and west. These facilities include the two subways—Interborough Rapid Transit (east side and west side) and Brooklyn-Manhattan Transit (including the Fourteenth Street crosstown subway); Pennsylvania Station (under cover all the way to Wanamaker's via the B.-M.T.); Grand Central Terminal (also under cover to Wanamaker's via I.R.T.; and for that matter, under cover all the way from the great number of stations it taps on the Putnam, Hudson and Harlem divisions of the New York Central, and on the New York, New Haven & Hartford railroads); Hudson Tubes from New Jersey; Holland Vehicular Tunnel from New Jersey; Fifth Avenue buses; four elevated lines—the Second, Third, Sixth and Ninth Avenues; and surface cars on Broadway, Fourth Avenue, and on the Eighth Street crosstown line. In addition, there is a Baltimore & Ohio Railroad bus terminal at Wanamaker's, for arriving and departing passengers.

Both New York subways have station entrances within the Wanamaker store, the Interborough since 1904 and the Brooklyn-Manhattan since 1917. Through these stations millions of customers yearly come to the New York Wanamaker's from points as far away as Boston without exposure to rain or snow or cold, no matter how stormy the day—for they travel under cover the whole way.

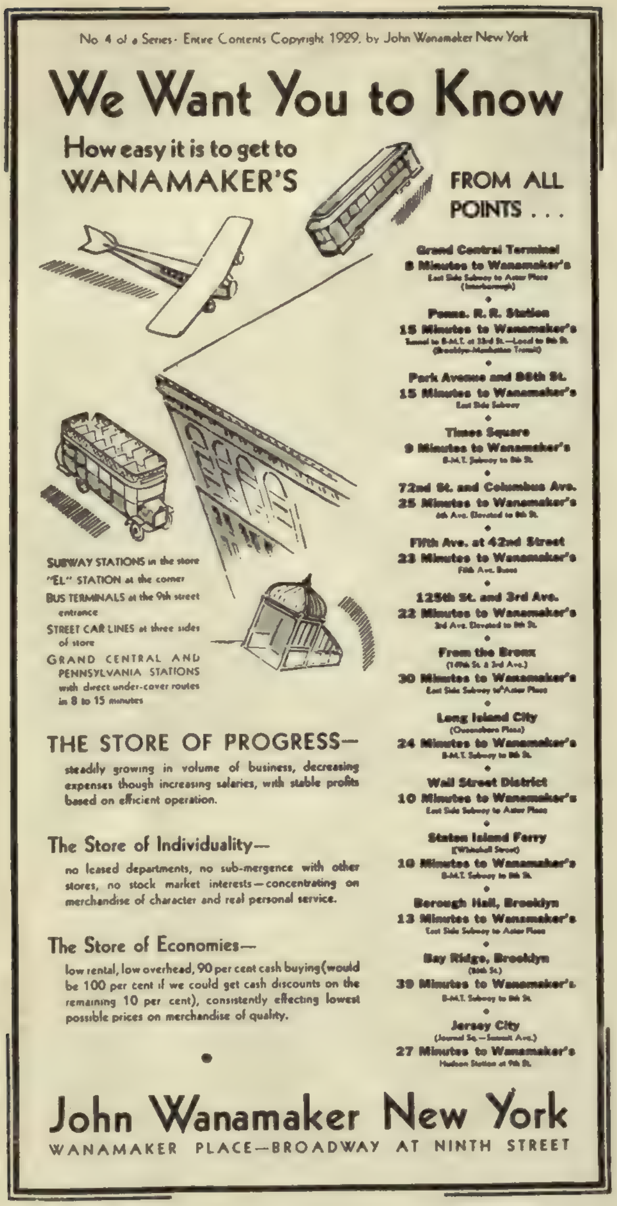
USE OF AUTOMOBILES BY SHOPPERS GREATLY OVERESTIMATED

Many customers, of course, come to the store by private automobile, but the importance of this factor is not so great as might be thought. Erroneous ideas on this subject are often met. For example, in answer to recent inquiry made by the Better Traffic Committee of Pittsburgh, the merchants of the downtown district estimated that 60 per cent of their business came by private automobile, but a careful survey showed that actually only 15 per cent of the customers used this means of transportation. Two years ago a canvass of merchants in the Fifth Avenue shopping district of New York City indicated their belief that a large part of their trade came by private automobile. When a count was made under the auspices of the Citizens' Street Traffic Committee, however, less than 4 per cent of some 140,000 customers, counted as they entered the stores in this area were found to come by private automobile. While the method of making this count was such that some automobile users who left their cars out of sight of the observers may have been incorrectly classified as pedestrians, the fact stands out clearly that this class of customer does not constitute any considerable part of the total number. A recent survey covering seven department stores in the central business district in Washington, a city noted for its wide streets and extensive use of private automobiles, showed a majority of customers using public transportation facilities to reach these stores and also that the purchases of these customers amounted to more than half of the total business done in the stores.

Joseph H. Appel

TRAINED first as a lawyer and then as a newspaper man, Joseph H. Appel wrote to John Wanamaker in 1899 suggesting that advertising is the *news* of a store, that it should be handled like news copy, and asked for a job. He got the job and he has been associated in an executive position with Wanamaker's ever since. Last year he wrote "The Business Biography of John Wanamaker," and it was immediately chosen by two "Business-Book-of-the-Month Clubs" as presenting the best business life of this pioneering merchant. Mr. Appel is a student and leader of advertising and merchandising and has written much on these subjects. The relationship between transportation facilities and retail trade is a matter to which he has given much thought. He is also interested in mental science and has written two books on this subject as applied to business and life: "Living the Creative Life" and "The Making of a Man." And as a result of his world-wide travels he has written "A World Cruise Log" and "Africa's White Magic." Mr. Appel recently had conferred on him the degree of Doctor of Laws by his alma mater, Franklin & Marshall College, Lancaster, Pa.

Wanamaker's is fortunate in having a location which is readily accessible to users of private automobiles. Nevertheless, the proportionate number of patrons who come to us in this way is comparatively little. Parking space in the vicinity of our store will accommodate about 200 automobiles. Even when this parking space is used



No 4 of a Series · Entire Contents Copyright 1929, by John Wanamaker New York

We Want You to Know

How easy it is to get to WANAMAKER'S FROM ALL POINTS . . .

Grand Central Terminal
8 Minutes to Wanamaker's
East Side Subway to Astor Place (Interborough)

◆

Penna. R. R. Station
15 Minutes to Wanamaker's
Tunnel to B-M.T. at 33rd St.—Local to 8th St. (Brooklyn-Manhattan Transit)

◆

Park Avenue and 86th St.
15 Minutes to Wanamaker's
East Side Subway

◆

Times Square
9 Minutes to Wanamaker's
B-M.T. Subway to 8th St.

◆

72nd St. and Columbus Ave.
25 Minutes to Wanamaker's
6th Ave. Elevated to 8th St.

◆

Fifth Ave. at 42nd Street
23 Minutes to Wanamaker's
Fifth Ave. Buses

◆

125th St. and 3rd Ave.
22 Minutes to Wanamaker's
3rd Ave. Elevated to 8th St.

◆

From the Bronx
(149th St. & 3rd Ave.)
30 Minutes to Wanamaker's
East Side Subway to Astor Place

◆

Long Island City
(Queensboro Plaza)
24 Minutes to Wanamaker's
B-M.T. Subway to 8th St.

◆

Wall Street District
10 Minutes to Wanamaker's
East Side Subway to Astor Place

◆

Staten Island Ferry
(Whitehall Street)
10 Minutes to Wanamaker's
B-M.T. Subway to 8th St.

◆

Borough Hall, Brooklyn
13 Minutes to Wanamaker's
East Side Subway to Astor Place

◆

Bay Ridge, Brooklyn
(86th St.)
39 Minutes to Wanamaker's
B-M.T. Subway to 8th St.

◆

Jersey City
(Journal Sq.—Summit Ave.)
27 Minutes to Wanamaker's
Hudson Station at 9th St.

SUBWAY STATIONS in the store
"EL" STATION at the corner
BUS TERMINALS at the 9th street entrance
STREET CAR LINES at three sides of store
GRAND CENTRAL AND PENNSYLVANIA STATIONS with direct under-cover routes in 8 to 15 minutes

THE STORE OF PROGRESS—

steadily growing in volume of business, decreasing expenses though increasing salaries, with stable profits based on efficient operation.

The Store of Individuality—

no leased departments, no sub-mergence with other stores, no stock market interests—concentrating on merchandise of character and real personal service.

The Store of Economies—

low rental, low overhead, 90 per cent cash buying (would be 100 per cent if we could get cash discounts on the remaining 10 per cent), consistently effecting lowest possible prices on merchandise of quality.

●

John Wanamaker New York
WANAMAKER PLACE—BROADWAY AT NINTH STREET

Another advertisement, indicating how easy it is to reach the store from any point by using public transportation agencies

to capacity, the number of customers involved is but a small fraction of the total. Actual counts have shown that in all more than 2,000 people entered the store during a single half hour, and more than 50,000 between 5:30 and 9 in the evening when the store was open for Christmas shopping.

The ability of public transportation means to bring to a store a great number of people in a short interval of time is an extremely important factor. Just as the transportation companies experience a crowding of their facilities during the morning and evening rush hours, so do the department stores have their peak periods. There are certain times of the day when a great many people can shop conveniently, and who must either buy at this particular time or not at all. Subways, surface cars and bus lines can deliver thousands of patrons at Wanamaker's doorstep within the course of a half hour. If these same people were all to drive to the store in private automobiles, it would actually take more than a day for them all to find a place to park.

A mistaken idea that is sometimes encountered is that the best location for a store is where the largest number of people pass the corner. That is not always true, by any means. There may be too many people—too much congestion, especially if the people are merely passing, hurrying to get somewhere else. When foot traffic past a store is merely on its way to some other place it may dis-serve and not serve the store. A store directly on a through route is not so apt to get customers as one near to such a route, or at the end of the route.

Wanamaker's has had experience of this kind. The direct motor route from the financial district downtown to the uptown residence districts passes directly by the store. Thousands of automobiles pass up and down in front of the store every day, but while they are on this through traffic route, it is difficult to get their passengers to stop at the store for shopping, even though a direct advertising appeal is made to them.

Another example: thousands of people pass through the station at Bridgeport of the New York, New Haven & Hartford Railroad, but a lunchroom and a paper stand make up practically all of its business activity, because the people pass through, and do not stop. On the other hand, the Grand Central Terminal in New York is dotted with hundreds of small shops all paying a high rental and all apparently doing a healthy business, because it is a traffic terminal. All this seems to show that the best store location in large cities is where the best public transportation facilities are to be found, and at traffic terminals rather than on through-traffic routes.

That Wanamaker's believes in the importance of mass travel facilities is demonstrated by the emphasis placed on the means of reaching its store in all of its newspaper advertisements. This point is always stressed, and to advantage. The fact that both the Interborough and B.-M.T. subway systems have stations at the store, and that they are connected directly with the buildings is stated on every possible occasion. Not long ago, the company sponsored a long series of advertisements, showing how people residing in any particular spot of the entire metropolitan area could reach the store by mass transportation means conveniently. In other words, Wanamaker's realizes the importance of public means for bringing customers to its store and does not hesitate to express its faith in these facilities.

This is the fourth of a series of articles by prominent men outside the electric railway industry, expressing their views on transportation subjects. The fifth will appear in the next issue.

◆

The Parking Problem

DISCUSSING the opposition which has been voiced to the proposed plan for stricter parking regulations in Philadelphia, the *Public Ledger* says:

> There are marked differences of opinion among business men concerning the actual effect upon trade of parking restrictions. A survey in Chicago and in other cities has shown that only a small proportion of the customers of the large retail stores come and go in private automobiles, and a test of strict no-parking rules in the Illinois city has confirmed the accuracy of that finding. It would seem that the part of wisdom for Philadelphia would be to give the traffic engineer a fairly free hand in his effort to find a solution to a problem that grows daily in seriousness. Only by actual trial and count can there be any hope of ascertaining the effect of restricted parking. But no rule will be of the slightest value if it is impossible of enforcement.

PROFIT SHARING PLAN

Adopted at Kansas City

By

F. G. BUFFE

Vice-President in Charge of Operations
Kansas City Public Service Company

Twenty-five per cent of net income invested in securities of the company for employees. The plan became effective on Jan. 1, 1931. First quarter share to employees was $38,628

IN RECOGNITION of the loyalty, efficiency, interest and co-operation of its 2,250 employees, the Kansas City Public Service Company has made them partners in its enterprise to the extent of 25 per cent of the net income. This plan became effective on Jan. 1 and for the first quarter the amount of the employees' participation was $38,628. Every employee and official, who has been in the service for one year, shares in the fund with the exception of the chairman of the board, chairman of the executive committee, the president, and the two vice-presidents.

Payment is not made in cash. The fund is kept intact under a trust agreement and invested in the securities of the company for the benefit of the participants. Each eligible employee receives a participation certificate at the end of each quarter showing his share for the quarter in the trust holdings. This share is based upon the proportion which his earnings for the quarter bear to the total payroll of all eligible employees.

When the plan was first announced it was stated that payments would be made in cash. Later the benefits of employee ownership and the opportunity for the employees to share in any enhancement in value of the securities were so apparent that the investment plan was worked out. The question of cash payment or security investment was submitted to a vote of the employees, the majority to prevail, and this vote was 2,206 for securities against 32 for cash. There were thirteen employees not voting due to sickness or absence. The two plans were carefully explained in detail at a series of group meetings, and the officers and officials frankly recommended the investment plan. The almost unanimous vote that followed indicated the confidence of the organization in the property and in their officials.

The participation plan sets aside every quarter 25 per cent of the net income for the fund. Net income is defined as follows: From the total gross revenue the following deductions are made:

All operating expenses, including wages, materials and supplies for operation and maintenance, depreciation and other operating reserves, cost of injuries and damages, insurance, etc.

Taxes or reserves for taxes of every nature—city, county, state and federal.

Interest on bonds or notes, or other funded debts or obligations, fixed charges or reserves for fixed charges.

The remainder or net income is divided 25 per cent to the participation fund and 75 per cent to the stockholders, but the employees receive their share whether or not a dividend is declared.

Every employee, with the exception of the corporate officers noted above, who has been in service one year and who does not violate the provisions of the contract of employment, or who does not violate the principles expressed in the constitution of the Kansas City Public Service Employees' Brotherhood, shares in the fund. Employees in service for less than one year will participate beginning with the first quarter after they become eligible.

The fund and its investment, eligibility, and all details and regulations are covered by a "Trust Agreement" between the company, the trustees and the employees. The board of trustees is composed of the following officers and employees:

Chairman of the executive committee, president of the company, vice-president, vice-president in charge of operations, employee's representative on the board of directors, president of the Kansas City Public Service Employees' Brotherhood, and an additional employee to be elected by employees.

Under the plan the interest and dividends on securities owned may either be paid out to certificate holders or reinvested at the option of the trustees. The certificates of participation are transferable to other employees only, and then only on the approval of the trustees. This approval is required to protect employees against selling their certificates at less than their value and to prevent groups or pools among the employees for speculative purposes. At least twice a year the trustees shall issue a statement showing the kinds of securities in the trust and the average price at which they were bought. Whenever any employee has units equaling the lowest denomination of securities he can exchange his certificates for the securities themselves. In such instance he draws out his proportionate share of all securities. In the event of an employee leaving the service his certificates can be cashed at the market price of the equivalent securities.

Had this plan been in effect during the past four years, the employees would have received amounts as follows:

1927	$129,524
1928	113,680
1929	102,517
1930	112,236

The company's budget estimate for 1931 shows a total of $125,190 for the fund.

For the first quarter of 1931 there were 2,155 eligible employees. The fund was $38,628. The total payroll of eligible employees for the quarter was $815,207. Therefore, each eligible employee will receive 4.735 per cent of his quarter's earnings.

The board of trustees invested the first quarter's participation in the 6 per cent first mortgage bonds of the company. It bought $80,000 of these bonds, the average price being $45.52. The yearly income, therefore, from the first quarter's investment will be $4,800, or more than 13 per cent.

There can be no question of the beneficial effects of this plan on the organization as a group. The Kansas City Public Service Company for the past ten years has had an extremely satisfactory situation from the standpoint of employee relations. It has a highly intelligent group of employees. They have co-operated to the utmost with the management. This has been shown in many ways, especially in the change-over to 100 per cent one-man operation. This was begun in June of 1927 and completed by September of 1928. There was not only no protest from the employees; on the contrary, they gave their best efforts to sell the idea to the public. As a result there was no public protest or criticism.

It was hardly believed possible that the organization as a whole could show more interest or co-operate more harmoniously than it had, yet the installation of the profit sharing plan and employee investment has shown otherwise. The entire organization is on its toes. In accident reduction, courtesy, careful operation, efficiency, economy —in fact, in every possible direction—the effects are seen. Individual cases are constantly being related. Bulletins on earnings and participation are published monthly, and are eagerly read and discussed.

The result of the first three-months' operations have been very satisfactory, in spite of business conditions and the decrease in passengers. The total operating revenue was $2,068,529, or $115,355 less than the same period in 1930. However, operating expenses were reduced $177,189, and the increase in net income was $66,532. The company is convinced that the participation plan had much to do with this showing. When discussing efficiency and proper operation, the employee now feels that over and above his wages he is financially interested in the company and the results. For every dollar he helps save and for every extra dollar his efforts help bring in the fund he gets 25 cents.

The following extracts are from the booklet describing the plan and recommending the investment feature, prior to the vote and adoption by the employees.

> The officers believe the present situation, through security investment, offers a splendid opportunity for the employees in a few years to build up substantial savings out of the extra money they receive from this plan. The securities of the company can now be bought at a low price. Further economies and operating efficiency, coupled with a betterment of general business, should show substantial improvement and increased earnings.
>
> The alternative method of paying the participation in cash is not recommended. An employee would receive a comparatively small amount each quarter, at least under present business conditions. He would lose the opportunity of co-operative buying of securities and of sharing in a savings and investment plan that over a period of years would give him a substantial sum. The savings feature is one that should be carefully considered. This extra money will be saved and invested. With interest added, it will soon grow into a sizable amount. It will form the nest egg of a savings account and its speculative feature may, if conditions prove favorable, greatly enhance the principal. Cash payments would not permit the employee to become a part owner in the property. Both methods will be thoroughly discussed at meetings and every employee will vote on the method of distributing the fund. The method designated by the majority will be adopted.
>
> To a large extent this plan of employee participation makes it possible for the employees to determine to some degree the amount of their share. Careful operation, economies, accident prevention, courtesy, neatness, and every phase of operation will have an effect in earnings. By this plan everyone will share directly from careful and proper operation, from courtesy and economy, from accident reduction, and from individual and combined efficiency.
>
> This plan is different from any now known. In many such savings and investment plans the employee is required to contribute cash. This participation is additional compensation, something actually taken from the stockholders' share. In many such plans the employee participates only when the stockholders get dividends. In this plan the employee gets his share regardless of whether or not earnings are actually paid out in dividends or invested in the property. In many plans the preferred stockholders come first and the employees only share with the common stockholders, or after something has been paid to the common stockholders. Many such plans fix an amount which must be earned before the employees participate, which amount often is never reached. This plan is different from any of these. In it the employee absolutely shares in *any* net income, in everything over and above operating expenses, depreciation, taxes and fixed charges. It is a splendid opportunity for the organization to increase income, secure savings and profit from investment.

The profit-sharing plan represents the culmination of more than ten years of intensive education and application of industrial democracy. There is no welfare work connected with it, in the ordinary sense of the term. While the employees have life insurance, health and accident insurance, free medical attention, free nursing service, free legal aid, a building and loan association, a band, and carry on a year-round program of social activities, these things are all done by the Kansas City Public Service Employees' Brotherhood as a co-operative enterprise. There is no compulsion and no employee is required to join. In other words, there is no paternalism. Each employee pays $1.75 a month, and while the company pays $1.40 a month per member, this feature is not emphasized. No employee is forced to accept these benefits unless he desires them. However, 99 per cent of them belong to it.

Through the Kansas City representation plan, employees are elected to committees in every division and department, and at the regular and frequent meetings of these committees every matter affecting the employees and their interests is worked out. Definite and complete information of the company's policies and financial results are given to these committees and to the entire group. The Kansas City Public Service Company's policy positively maintains that interference or dictation by outsiders is neither advisable nor desirable.

The company is convinced that the last step in the program of giving the employees a share above wages in profits, and making them actual investors in and part owners of the property, is a step in the right direction. It makes interest, enthusiasm, harmony and co-operation pay actual dividends and adds a tangible incentive.

Attractoscope Tells Railway Story at Progress Exposition

MUCH interest was aroused at the recent Progress Exposition in New Haven by the display in the booth of the Connecticut Company of an "attractoscope," or automatic lantern slide exhibitor, which showed a program of 50 slides and then repeated without requiring attention. It was expected that the shifting pictures would attract interest, but the result was far above expectations. The exposition was of seven days' duration, opening at 1 o'clock and remaining continuously open until 10:30. In the entire period there was practically no time when the booth was empty, and frequently the audience completely blocked the aisle, as well as crowding the booth.

The program started with the statement and explanation: "The Connecticut Company carries you swiftly, surely, safely, smoothly. Ride in its cars and buses." Then followed an illustrated history of city transportation in New Haven, beginning with the reproduction of an interesting old print of Yale College in 1786, when everyone used "Shanks Mare." This was followed by some street views of old New Haven with ox cart, private carriage and stage coach in use, while interurban traffic was represented by the old Northampton Canal. It was the next group, however, that of the horse cars, which received the greatest attention, those who had ridden them often seeing the program through several times and then bringing in youngsters to see a means of travel they "would never see except in pictures."

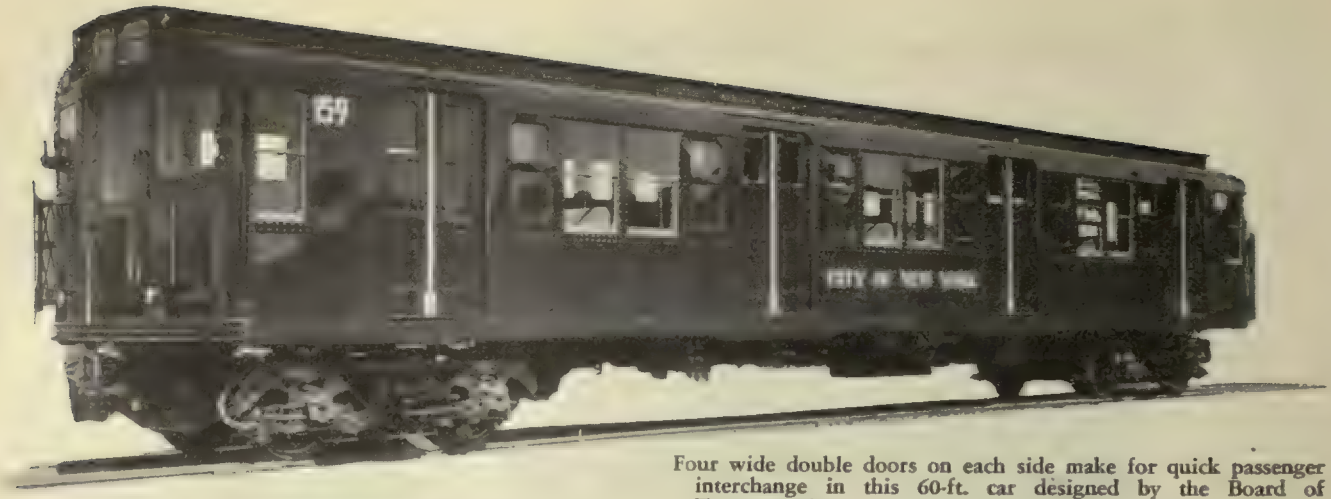
Pictures of the first electric railways in Connecticut followed. It was pointed out that in less than nine months from the date of the operation of the first successful electric car in Richmond, Va., in 1888, "Little Old Connecticut" had in operation three lines: Derby, Meriden and Hartford. Then was shown the safety car "with automatic controls offering the public every possible protection against carelessness."

To show "why the cars are sometimes late" there was a series of views starting with a horse car buried in the drifts of the great blizzard of 1888, then "electrics" in later storms, and finally trucks and autos blocking the tracks; while slides of welders, grinders, snow cleaners, derricks, electric shovels and similar equipment told how much auxiliary machinery is necessary to keep the lines in operation. Safety and service control by the Connecticut Public Utilities Commission, which has received little publicity and is known to comparatively few car riders, was pointed out by the title, "Believe it or not, the Public Utilities Commission inspects every foot of track every year," followed by a view of the car used and the inspection party of a previous year. Finally, the bus operation was covered by pictures of both old and modern vehicles.

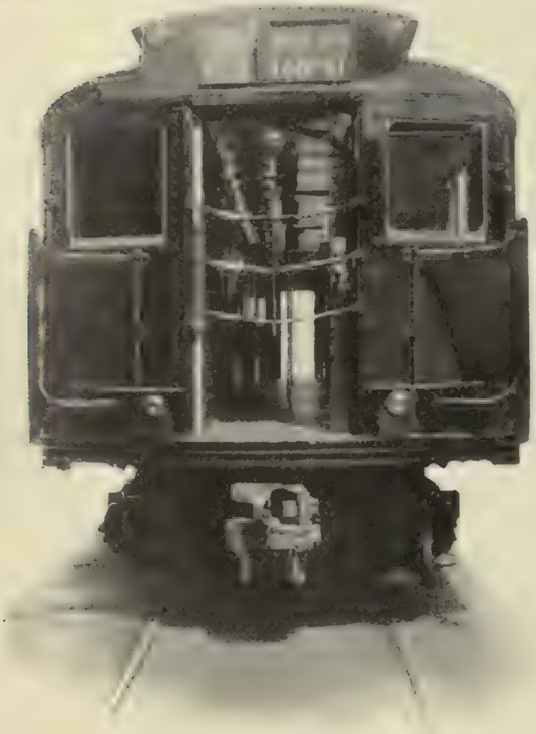
Scattered among the other slides, a series of statements pointed out the advantages of the services offered by trolley, by bus and by trolley express, reminding the public that cars and buses could be chartered for private parties. Co-operation in relieving the congestion in the business district was urged, and the condition shown by the street view of one trolley car and the 36 automobiles carrying as an average the same number as can the trolley.

Not the least interesting feature was the reaction of the company employees. It was thought that in view of the pressure of their own work it would be necessary to assign men to attend, but as a first step volunteers were called for on the basis of two shifts per day. The response was so enthusiastic, however, that the work was divided into three shifts per day, and then more men volunteered than there were shifts available.

The reaction of the public was extremely satisfactory. Whether or not any individual was persuaded to increase his or her riding, as a result of the display and the "sales talks," it is impossible to determine. It is fair to assume, however, that some of the facts "went home," and the Connecticut Company feels satisfied that its small expenditure was at least reasonably justified.



Four wide double doors on each side make for quick passenger interchange in this 60-ft. car designed by the Board of Transportation



A clear passageway through the entire train can be obtained without danger to the passengers. Illuminated route signs are an innovation

Loading Speed

Board of Transportation develops rapid transit car of improved type for use on new city-owned lines. Many advances have been made over existing designs

WHEN the Board of Transportation perfected its plans for the new subway system authorized for New York City, a change from the previous procedure was deemed necessary. In the former contracts the operating companies leased the bare subways built by the city and themselves provided the necessary equipment, including cars, power and miscellaneous apparatus. On account of uncertainty as to the arrangement under which the new lines will be operated, it became necessary for the city to provide the complete equipment in order to avoid serious delay in starting service.

Accordingly, the design of the cars was undertaken by the Board of Transportation. At the request of the board, J. S. Doyle of the Interborough Rapid Transit Company, W. G. Gove of the Brooklyn-Manhattan Transit Corporation, W. B. Potter of the General Electric Company, A. E. Ostrander of the American Car & Foundry Company, and W. H. Mussey of the Pullman Company, along with H. N. Latey and J. O. Madison, served as a committee regarding the best type of car for the subway service. During the six months this committee deliberated some 75 different arrangements were considered and analyzed. While it was not possible to obtain a unanimous opinion in favor of any one type of car, it was agreed that the car decided on by the board will be an effective transportation unit.

Three distinct types of rolling stock are in use on the existing rapid transit subway lines in New York City. The cars of the Interborough subway are approximately 51 ft. long and 9 ft. wide, while the standard B.-M.T. subway cars are 67 ft. long and 10 ft. wide. The three-unit articulated cars of the B.-M.T. are 137 ft. long and 10 ft. wide. The clearances adopted in the new subways make them suitable for the B.-M.T. cars. Accordingly, in most of the principal dimensions those of the latter were followed in the design of the new cars. The two types can use the same tracks and the same station platforms. While the differences in control and electrical equipment prevent operating them interchangeably, they can be coupled together in emergencies.

It was decided that better service could be rendered by making the maximum length of the new car 60 ft. instead of 67 ft. as in the B.-M.T. car. This made it possible to place the truck centers nearer the ends of the cars, reducing overhang and end swing and permitting a somewhat lighter framing. It also allows passengers to pass from one car to the next without danger, even on curves. It was decided to build single units, each with two motors on one truck, making all the cars interchangeable, in order to obtain maximum flexibility of service.

In selecting the type of car a study was made of the various elements limiting the number of trains per hour, as this determines the capacity of the line. Accelerating and braking rates were set at 1.75 m.p.h.p.s., which with the present type of control was believed to be as high as possible without discomfort to the passengers. Closing-in signals are provided at all congested points, so that no further material saving could be made in the time of entering or leaving stations. Hence, the limiting condition in the passenger capacity of the subway was determined to be the length of station stop.

The new car was so designed that one-fourth of the load will be in the zone of each of the four side doors provided. The seat arrangement also was selected with a view to directing passengers toward the nearest door. Though it would be possible to increase the number of doors on each side of the car beyond the four actually adopted, it would result in a serious reduction in the number of seats if a normal arrangement is used. As a compromise between maximum track capacity and number of seats the four-door unit 60 ft. long and seating 60 passengers was adopted.

Double doors will open or close in about half the time needed with a single 4-ft. door. The lighter door will reduce the blow should it strike a passenger standing in the doorway. Flexible edges have been installed on the doors, and their width at the bottom is increased by notching out the door sufficiently that a man's foot may be withdrawn after the door is fully closed. This feature

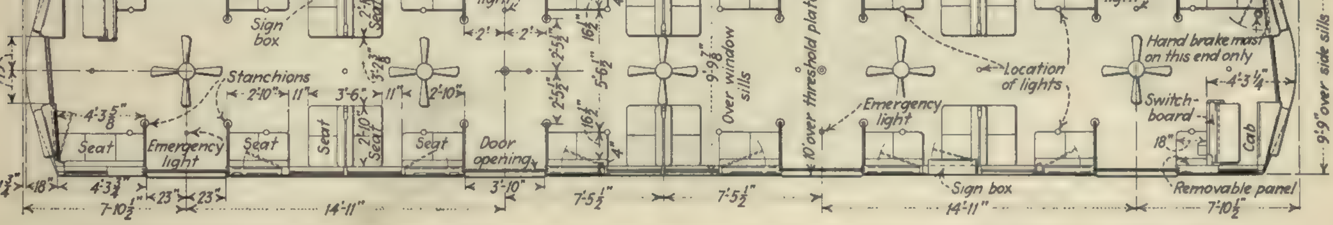
a Major Factor in Design of NEW YORK SUBWAY CARS

With operation of about 30 trains per hour, which is approximately the maximum in the existing subways, it is evident that the saving of four seconds per train in the time of stop increases the capacity of the track by one train per hour. In order to determine how the maximum saving in stopping time can be obtained, studies of station stops were made at the most congested subway stations in New York, and many observations were made of the speed of loading and unloading. It was found that all of the present cars have their doors so located that the natural distribution of traffic between them is unequal. In the Interborough cars more passengers use the center doors than either of the end doors. In the long B.-M.T. cars the end doors have the heavier traffic. By equalizing the door zones the number of passengers boarding and leaving should be about the same at all doors, and the time of interchange reduced.

obviates the need for the "sensitive edges" used on some of the subway car doors. It also was decided to keep the door openings free of posts or divisions of any kind, as these reduce the capacity of the door.

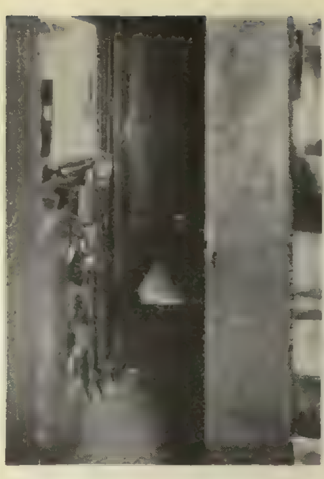
The multiple-unit control practically removes any limitation as to train length. The public, however, demands stations fairly close together, which makes operation of long trains difficult. It was decided that all interests would be served best by the use of trains of ten 60-ft. cars, and the station platforms were designed accordingly, with provisions for lengthening them to accommodate eleven cars if that becomes desirable in the future.

Comparing the standard trains for subway service, ten cars of the Interborough type, eight cars of the B.-M.T. 67-ft. type, or ten cars of the new Board of Transportation type, it was found that the number of trains per hour which can be moved through the most congested stations,



The car body is divided by the seats into four equal sections, each served by a pair of doors on either side

Seats for 60 passengers are so placed that it is easy to reach the nearest doors



Control equipment is grouped in a permanent cab at each end of the car

Interior signs show route and destination in clear characters

General Specifications, Board of Transportation Subway Cars

Name of Railway	Board of Transportation, City of New York
Number of units	300
Type of unit	Motor, passenger, subway, double end, double truck
Number of seats	60
Builder of car body	American Car & Foundry Co., Berwick, Pa.
Date of delivery	1931
Weights: car body	48,300 lb.
Motor truck with gears and shoe beams	14,100 lb.
Two motors, less gears	10,000 lb.
Trailer truck, complete	11,900 lb.
Total	84,300 lb.
Bolster centers	44 ft. 7 in.
Length over coupler faces	60 ft. 6 in.
Length over body posts	57 ft. 0 in
Truck wheelbase	Motor 7 ft. 0 in. Trailer, 6 ft. 3 in.
Width over all	10 ft. 0 in.
Height, rail to roof	12 ft. 2 in.
Door spacing	14 ft. 11 in.
Body	All steel
Air brakes	Westinghouse Traction Brake Co.
Armature bearings	Bronze
Anticlimbers	Waugh Equipment Co.
Axles	Heat-treated carbon steel
Car signal system	National Pneumatic Co.
Compressors	Westinghouse D-3-F
Conduit light-weight steel	Steel & Tubes, Inc.
Conduit fittings	Appleton Electric Co.
Control	Westinghouse ABF, UP Type
Couplers	Westinghouse Traction Brake Co., H-2-A
Destination signs	Hunter
Door mechanism	National Pneumatic Co
Doors, double, sliding.	Four on each side of car, made of aluminum
Draft gear	Waugh Equipment Co.
Energy saving device	Coasting clock
Fans	Westinghouse Elec. & Mfg. Co.
Finish, paint	100 cars each Murphy, Dupont and Sherwin-Williams
Floor covering	Tuco
Floor sheets	Johns-Manville Co. truss plate
Gears and pinions	Westinghouse-Nuttall
Glass	¼-in. and 3/16-in. plate
Hand straps	Waugh Equipment Co.
Heat insulating material	Johns-Manville Co. Salamander
Heaters	Consolidated Car Heating Co.
Headlining in upper deck	Agasote
Journal bearings	Bronze, 5x9
Journal boxes	Symington
Lamp fixtures	Adams & Westlake Co.
Motors	Two Westinghouse No. 570-D-5, inside hung
Painting scheme	Dark green
Roof type	Monitor
Roof material	Steel
Sash	O. M. Edwards Co. brass
Seats	Hale & Kilburn stationary
Seating material	Rattan
Signal system	National Pneumatic Co.
Slack adjusters	Sauvage
Stanchions	Ellcon Co., porcelain enameled
Switchboards	Consolidated Car Heating Co.
Trucks	American Car & Foundry Co.
Ventilators	Monitor sash
Wainscoting	Thermasote
Wheels, type	Carnegie rolled steel, diameter 34¼ in. motor and 31¼ in. trailer
Wire and cable	Standard Underground Cable Co.
Springs	Chrome-vanadium elliptic and high silicon coils Pittsburgh Spring & Steel Co.
Motor leads, shoe leads and truck trolleys	Okocord and Rockbestos.

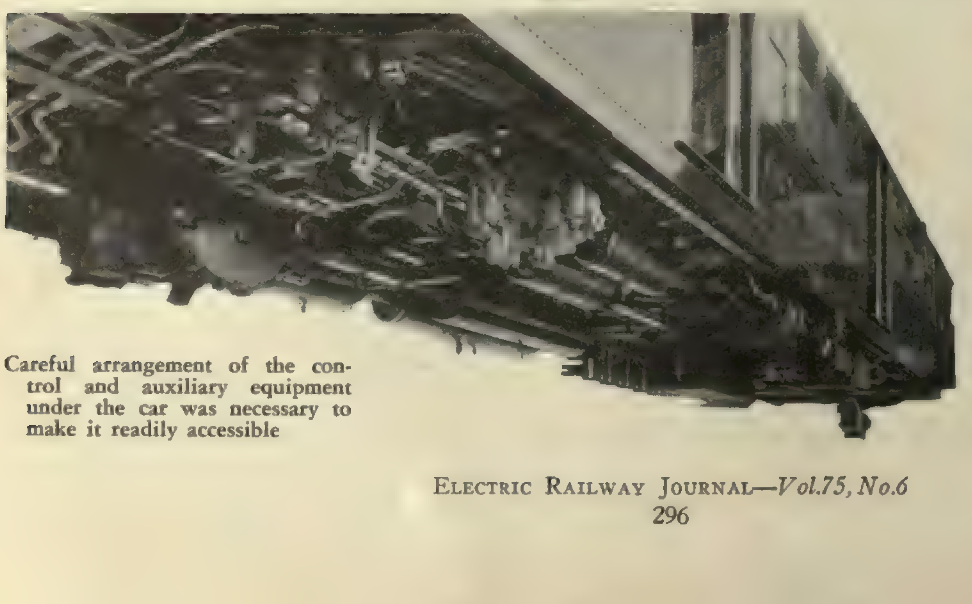
and the resultant passenger capacity are, respectively:

	I.R.T. Subway Car	B.-M.T. 67-ft. Car	New City Car
Trains per hour	29.7	30.7	32.2
Maximum passengers per car	200	300	280
Maximum cars per train	10	8	10
Passengers per train	2,000	2,400	2,800
Passengers per hour	59,400	73,400	90,160

Thus the new car will permit an increase in train capacity above the I.R.T. equipment, due to the door arrangement, and an increase in hourly capacity from all causes that in the aggregate amounts to about 50 per cent.

Since car weight affects operating costs directly, every effort has been made to hold it down. The final scale weight for the car is 84,300 lb., as compared with the 85,000 lb. specified. This weight is relatively low for a 60-ft. long, 10-ft. wide car with two 190-hp. motors, automatic car, air and electric couplers, air brakes, and four double doors on each side of the car.

Each specialty manufacturer contributed to the weight reduction. A portion of the saving in weight was made by the use of aluminum, which is found in the doors, door devices, seat boxes, parts of the headlining, trim, cab construction, and some of the junction boxes and miscellaneous parts. The total saving in weight amounts to some 2,700 lb. per car. A comparatively new weight-saving feature was the use of thin wall conduit. Its internal diameter is the same as that of standard conduit, but the walls are only 1/16 in. thick. Threadless fittings facilitate installation. This was particularly true with bent sections, and some lengths of conduit could be placed in locations that would have been practically out of the question with screw fittings.



Careful arrangement of the control and auxiliary equipment under the car was necessary to make it readily accessible

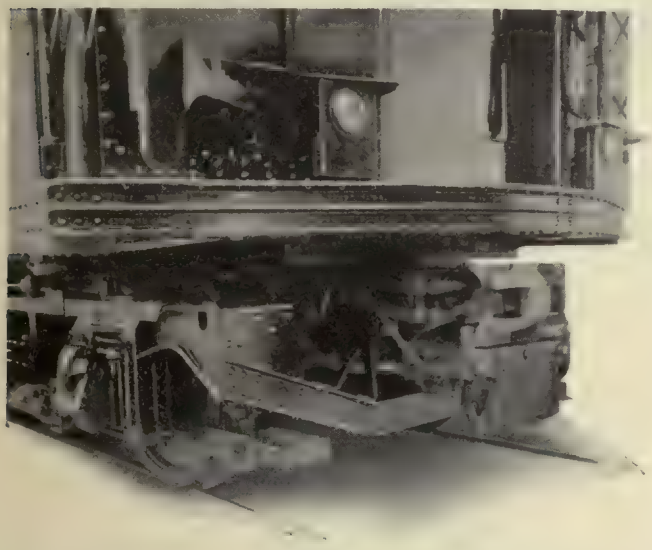
The complete car weighs 1,395 lb. per running foot when empty. With a full load of 280 passengers (39,200 lb.) the weight is 2,041 lb. per run-ing foot. The weight per seated passenger is 1,545 lb., and per total passenger at full load it is 441 lb.

The trucks are of the A.C.F. pedestal type. All members except the pedestals, journal boxes, transom gussets, side frame and bolster center castings, which are cast steel, are rolled bar or structural shapes and plates. Coil springs mounted on the journal boxes are high silicon steel and elliptic springs are chrome vanadium. The motor truck has a wheelbase of 7 ft. and the trailer truck 6 ft. 3 in.

Each car has one trailer truck of the type shown. All wheels have clasp brakes

The motor truck, while light, is of exceptionally rugged construction

Westinghouse Traction Brake Company H-2-A couplers are used, as are Westinghouse air brakes, with 18 x 12-in. cylinders. Variable load mechanism provides for a standard rate of retardation and acceleration irrespective of the number of passengers on the car. The cars have automatic slack adjusters on the brake cylinders, and the motor trucks have shim slack adjusters. Both motor and trailer trucks have Simplex clasp brakes and Diamond S brakeshoes.



Connections between cars, including air and electric circuits, are made automatically through Westinghouse couplers

Each car is driven by two Westinghouse No. 570-D-5, 190-hp. field control motors. Westinghouse ABF electropneumatic control makes it possible to run a train of from one to eleven cars from a single position. Control is of the automatic battery field type, with acceleration set at the rate of 1.75 m.p.h.p.s. There also is a variable load feature for the accelerating relays, so that the rate of acceleration is maintained regardless of load. The operating coils of the line switch are actuated with trolley current, so that the main motor circuit is opened immediately on loss of power, but the multiple-unit control is operated from a low-voltage storage battery. This simplified the design of the control apparatus, provided a means for easy testing of the control without the use of power from the line and causes all the high-voltage circuits to be interrupted under the floor of the car.

Good lighting of the car interior is obtained from 22 Mazda C Type A-21 automatic cutout lamps in series, each lamp taking 1.6 amp. at 30 volts. These are set in short-circuiting sockets. White enameled stanchions are so placed as to support standing passengers who cannot reach the enameled hand straps.

Four battery emergency lights per car go on if the power is off the line. Each car has an Edison 24-cell Type B-4-H battery, regulated automatically by a charging panel, which allows the battery to charge in series with the compressor motor, or, if this rate is not sufficient, directly from the third rail through a resistance.

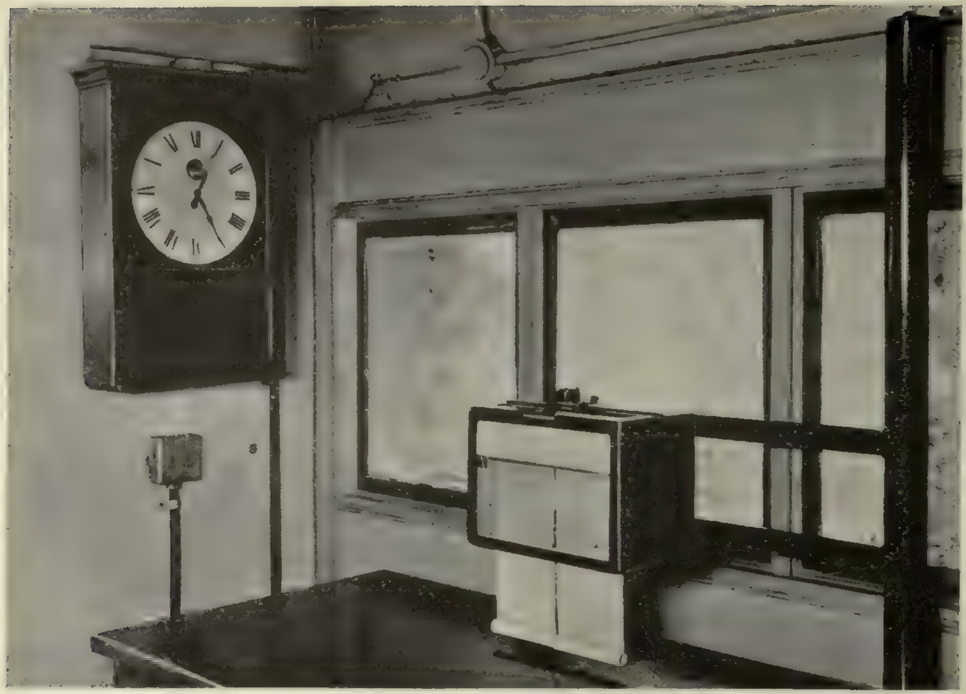
The car lamps, heaters, ventilating fans and destination signs have their circuits so arranged that they can be controlled from the motorman's position at the head of the train, for all eleven cars, the maximum number contemplated, or less. The destination signs on the ends of the trains are adjusted by the motorman and once set for a particular line are not changed during the run. Side destination signs are set for the particular run, but the designation of the terminal toward which the train is proceeding is illuminated in color and is changed from one direction to the other by the setting of the motorman's reverser key. Besides the end destination signs which give the route number and destination in large illuminated characters, red and green illuminated signs on each side of the end of the train show whether it is a local or an express.

The door control is arranged for multiple-unit operation, the front half of the train, up to a maximum of six cars, being controlled by the conductor, and the rear half, of five cars or less, by the guard.

A safety feature embodied in the door control consists in having the electropneumatic door locks controlled by a separate circuit from that of the door opening and closing mechanism.

Twenty-six train line wires through the electric couplers carry battery current for control of motors, brakes, door engines, lamps, fans, heaters and destination signs.

The design, inspection and tests of the cars and their equipment have been done in the engineering department of the Board of Transportation, of which Robert Ridgway is chief engineer, J. R. Slattery, deputy chief engineer, H. N. Latey chief electrical engineer, and John O. Madison engineer of cars and shops. The latter was in direct charge of the work.



Master clock and the recording instrument, located in the dispatcher's office. Note the availability of charts for ready inspection

Service Improved with AUTOMATIC SCHEDULE CHECKER

By *J. F. Woolley, Jr.*

Chief Engineer Utah Light & Traction Company, Salt Lake City, Utah

DESIGNED to show the actual service rendered and at the same time the service scheduled, an automatic checking system, recently installed by the Utah Light & Traction Company, Salt Lake City, Utah, informs the dispatcher immediately of any deviations by car operators. Although the system has been in operation only a short time, a remarkable improvement has been made in regularizing service and maintaining proper headway.

Use of the device has made it possible to identify operators, who, inbound, run away from business on the outlying sections of the run and then waste time on the close-in section in order to pass the business district time points on schedule. Some of the first records obtained in tests showed that a number of operators had this tendency, and that it was responsible for improper spacing of following cars. Because of this, more stress has been placed on the inbound service, any variation greater than one minute from schedule being investigated and the operator cautioned to observe his schedule more closely. Each morning, supervisors look over the records being made on the routes under their individual charge, and very considerable rivalry has developed among them.

The instrument has furnished reliable information for the revision of schedules and running times. The record is valuable in case of questions arising concerning delays to service as well. It also furnishes a check on trainmen not reporting delays. Trainmen, setting their watches by a master clock that controls the recording system, soon learn that the system is reliable and registers without error or prejudice all failures to maintain schedules. The psychological effect of such a system on the operating personnel is a big factor in rendering dependable, regular service to the riding public. The annual saving already made possible by this installation practically equals the total investment in apparatus and outside circuits.

The entire checking system is controlled by a Stromberg electrically operated master clock, located in the dispatcher's office. Once each minute this clock closes a circuit, energizing all of the electromagnets driving the secondary clocks on the program instruments and on the recording mechanism. In this way, the entire system is electrically interlocked and kept in synchronism.

Schedules, both inbound and outbound, are laid off on program tapes for each route and mounted on standard Stromberg program instruments. These tapes are continuous bands of transparent, non-inflammable material, representing the 24 hours of the day graduated in minutes. The schedules are laid off by punching holes in the margin of the tape for each minute, the position of the hole representing the schedule time that a car should pass a time point. The tape is driven over two guide wheels at minute intervals by means of an electromagnetically operated secondary clock which receives its impulse at the closing of the contactors on the master clock. It is so placed that at a given minute the point on the tape representing that minute falls under the projecting end of a spring contact finger. If there is a hole in the margin of the tape the finger passes through and makes contact, closing a relay, which, in turn, closes the recording circuit. Thus the schedule time for the passage of a car is permanently recorded.

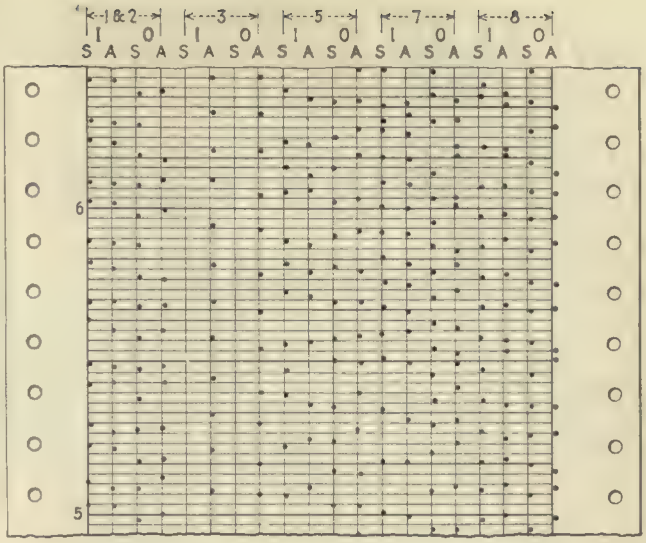
In the trolley wire at the time point is located a contactor, so constructed that the passage of a trolley wheel automatically closes a circuit, energizing a relay in the control room. The time the car is scheduled to pass and the time it does pass are recorded on the chart on adjacent vertical lines, the vertical space between the two records indicating the number of minutes off time, early or late. The charts used travel at the rate of 3 in. per hour and are graduated by horizontal lines into divisions representing two minutes. Charts used are 90 ft. long, limiting renewals to about once every two weeks.

A standard switchboard-type twin Esterline-Angus recorder case, rolls and a secondary clock with a capacity for two 6-in. charts, each with twenty vertical lines, are used as the recording instrument. The clock is spring driven with electro-magnetic release, the magnet being energized by a master relay, operated at minute intervals by the master clock. Recording is accomplished in a novel manner, the ordinary pen with ink being replaced by 40 pairs of stationary points (positive and negative), so spaced that each of the 40 vertical lines on the chart passes directly between a positive and a negative point. When a recording relay is closed, either by the program instrument or the passage of a car, a high tension spark passes between the points, burning a hole in the chart and making a distinct, ineradicable record. There are no pens to refill or wet ink to smear the record with this system.

The recording instrument is mounted on a revolving bracket of original design, permitting a supporting arm to be turned 180 deg. about a vertical axis. The recorder itself may be revolved 180 deg. on the bearings at the end of each supporting arm. This system permits either the dispatcher himself or an assistant who is seated at an adjacent desk to attend the machine during the rush period. These men perform regular duties in the office, so that no additional help is required for the operation of the schedule checking instruments.

The master clock and recording instrument with brackets are the only parts of the mechanism which are installed in the dispatcher's office. The battery, charging panel, program instruments, relay panel and coils are all located in a room in the basement of the office building.

Lock switches are provided in the dispatcher's office, one controlling the recording circuits on the "actual," and another the circuit on the "schedule" side. On Sundays and holidays, when the regular schedule is not operated, the schedule circuits can be opened, permitting the actual recording to continue. The instrument then becomes merely a headway recorder. It is restored to its function of schedule checker immediately by reclosing the switch.

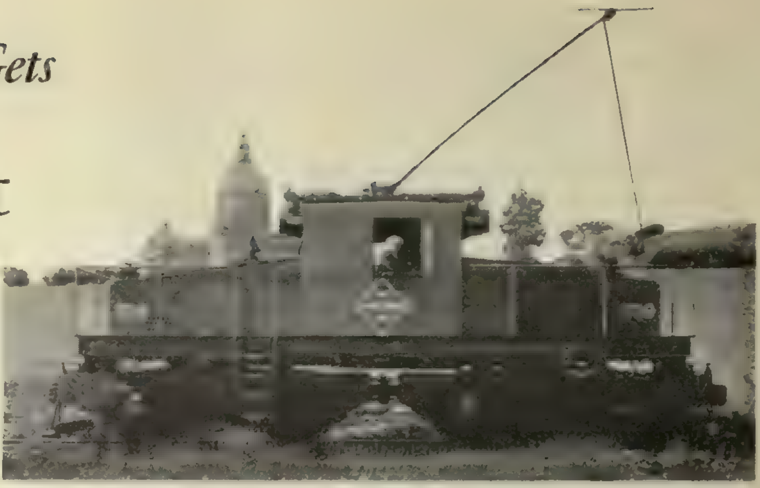


Sample chart from actual record, covering five lines from 4:46 to 6:28 p.m. Numbers at top indicate routes—letters I and O, inbound and outbound; letters S and A, schedule and actual. Figures in left margin represent the hour of the day

Control panels, the left one being for the master relay, the three in the center for the program instruments, and the right one for the closing and limiting relays

Fort Dodge Interurban Gets 75-Ton Freight Locomotive

By T. F. PERKINSON
Transportation Engineering Department
General Electric Company



This new locomotive has been purchased to handle increasing freight business in Central Iowa

INTERURBAN freight haulage increased to such an extent on the Fort Dodge, Des Moines & Southern Railroad, operating approximately 147 miles of line between Fort Dodge, Des Moines, Boone and other Iowa cities, that some time ago it placed in service a 75-ton, 1,200-volt road freight locomotive which was built at the Erie works of the General Electric Company.

The running gear is articulated, permitting a somewhat lighter platform construction than would be required were the stresses transmitted through the cab underframing. The trucks are of the built-up type, each side frame being made from a single rolled-steel slab.

The cab is of the steeple type. All auxiliaries and control equipment except master controllers, switches, etc., are housed in two end compartments.

The four direct-current series motors with single reduction gearing are grouped in pairs connected permanently in series. The motors are rated on reduced field at 270 hp. continuously and 300 hp. for one hour at the driving wheel treads. A gear ratio of 68/18 on 47 in. wheels and 73.5 per cent field strength results in a continuous speed of 19.6 m.p.h. and a speed of 18.6 m.p.h. at the hourly rating.

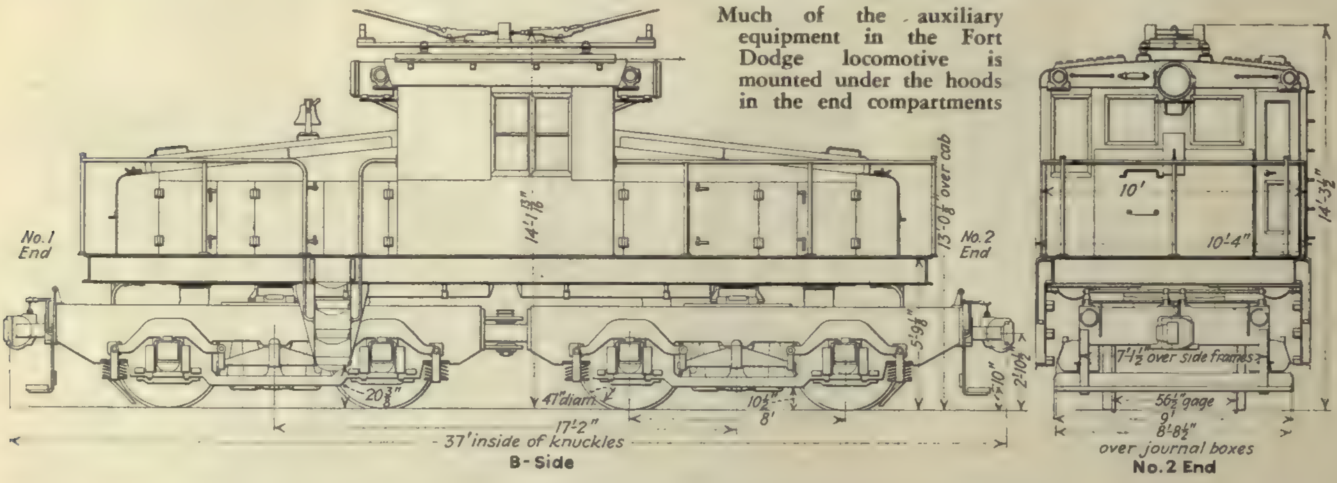
The control equipment is of the non-automatic, electro-pneumatic type arranged for single unit operation through two master controllers, giving eighteen steps, ten for the full series and eight for the series-parallel connections of the motors, two on shunted field.

Control and lighting energy is furnished by a 1,200/600-volt dynamotor. There is no battery.

The customary type of series overload relay prevents excessive overloading of the motors. Flashing studs located near the brushholders in each motor, in conjunction with a flashover relay, cut off power in the event of flashing at the commutators. Additional overload protection is afforded by a newly developed type of inclosed expulsion fuse, connected in the circuit ahead of the main switch.

Two CP-130-600/1,200-volt single-stage air compressors are connected in series across the line with the mid-point connected to the mid-point of the dynamotor for stability. They furnish 96 cu. ft. of air per minute at 90 lb.

Each pair of motors has a blower set consisting of a No. $2\frac{1}{2}$ Sirocco blower driven by a 600-volt motor, pairs being connected in series on the 1,200-volt line.



B-Side

No. 2 End

Much of the auxiliary equipment in the Fort Dodge locomotive is mounted under the hoods in the end compartments

Principal Data, Fort Dodge, Des Moines & Southern R.R. Locomotive

Class of service	Road freight and switching	Width over all	10 ft; 4 in.
		Height, trolley locked down	14 ft. $3\frac{1}{2}$ in.
Trolley volts	1,200	Wheelbase, rigid	8 ft. 0 in.
Track gage	$56\frac{1}{2}$ in.	Wheelbase, total	25 ft. 2 in.
Driving wheels	Eight, 47 in. diameter	Type of control	PCL single unit
Weight, total (all on drivers)	150,000 lb.	Propulsion motors	Four HM-818-B-1, 600/1,200 volt
Weight per axle	37,500 lb.		
Length inside knickles	37 ft. 0 in.	Gear ratio	68:18

Electrical Characteristics	Continuous	One-Hour Rating
Tractive effort, lb.	20,600	24,240
Speed, m.p.h.	19.6	18.6
Current, amp.	740	830
Output, hp.	1,075	1,200

Starting tractive effort, 25 per cent adhesion, 37,500 lb

Note—Ratings at 1,200 volts on trolley and motor fields shunted.

Industry Statistics for 1930 Reflect Business Situation

Electric railways engaged in city service made best showing, but all groups had a recession from the high marks of 1929. Figures compiled by A.E.R.A. show results of operation for the year by 86 per cent of the industry

WHILE the year 1930 is now a matter of history, it is interesting to look back and see the excellent manner in which the electric railway industry weathered the storm, which was by far the most serious that has overtaken it in its history. The results are given in considerable detail in statistics prepared by the staff of the American Electric Railway Association under the supervision of Edmund J. Murphy, director of information service. The tables published in this article, which have been furnished by Mr. Murphy, are similar in form to those presented in this paper for the past several years. They show strikingly the effects of the business situation on the various accounts, and make it possible to analyze accurately the situation up to the end of 1930.

Table I—Combined Operations of 282 Electric Railway Companies and 193 Controlled Bus Undertakings*

	1930	1929	Increase or *Decrease*† Total	Per Cent
Operating revenue.......	$791,835,096	$858,479,822	*$66,644,726*	*7.76*
Operating expense†......	605,067,830	634,627,120	*29,559,290*	*4.66*
Net operating revenue.	$186,767,266	$223,852,702	*$37,085,436*	*16.57*
Operating ratio, per cent.	76.41	73.92	2.49	3.37
Miles of single track.....	28,501.25	29,367.45	*866.20*	*2.95*
One-way miles of separate roads traversed by buses¹	12,284.93	11,620.65	664.28	5.72
Revenue passengers......	10,575,729,055	11,496,509,893	*920,780,838*	*8.01*
Total passengers.........	13,126,441,081	14,286,283,847	*1,149,842,766*	*8.05*
Revenue car- and bus-miles	2,129,224,002	2,182,442,601	*53,218,599*	*2.44*
Total car- and bus-miles.	2,139,940,727	2,194,843,265	*54,902,538*	*2.50*

*These preliminary tables include the reports of all companies received up to May 1, 1931. The income statement is not carried beyond "net operating revenue" because many of the companies included are combination railway, light and power companies that do not make any segregation of their railway taxes or fixed charges.

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that reporting companies included it in their operating expenses.

¹Not equivalent to miles of single track and therefore they cannot be added together.

Table II—Combined Operations of 282 Electric Railways

	1930	1929	Increase or *Decrease*† Total	Per Cent
Railway operating revenue	$715,835,821	$780,282,234	*$64,446,413*	*8.26*
Railway oper. expense†.	534,735,682	565,207,608	*30,471,926*	*5.39*
Net operating revenue	$181,100,139	$215,074,626	*$33,974,487*	*15.80*
Operating ratio, per cent	74.70	72.44	2.26	3.12
Miles of single track....	28,501.25	29,367.45	*866.20*	*2.95*
Revenue passengers.....	9,691,805,543	10,584,091,654	*892,286,111*	*8.43*
Total passengers........	12,112,527,557	13,249,711,269	*1,137,183,712*	*8.58*
Revenue car-miles......	1,830,015,893	1,899,658,550	*69,642,657*	*3.67*
Total car-miles.........	1,838,229,749	1,908,559,609	*70,329,860*	*3.69*

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that the reporting companies included it in their operating expenses.

Table III—Combined Operations of 193 Bus Undertakings Controlled by Electric Railways

	1930	1929	Increase or *Decrease*† Total	Per Cent
Bus operating revenue..	$75,999,275	$78,197,588	*$2,198,313*	*2.81*
Bus operating expense‡.	70,332,148	69,419,512	912,636	1.31
Net operating revenue	$5,667,127	$8,778,076	*$3,110,949*	*35.44*
Operating ratio, per cent	92.54	88.77	3.77	4.25
One-way miles of separate roads traversed by buses................	12,284.93	11,620.65	644.28	5.72
Revenue passengers.....	883,923,512	912,418,239	*28,494,727*	*3.12*
Total passengers........	1,023,913,524	1,036,572,578	*12,659,054*	*1.22*
Revenue bus-miles......	299,208,109	282,784,051	16,424,058	5.81
Total bus-miles.........	301,710,978	286,283,656	15,427,322	5.39

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that reporting companies included it in heir operating expenses.

Taking the industry as a whole, general figures have been obtained from 282 electric railways and 193 controlled bus undertakings. These include more than 86 per cent of the railway revenues of the entire electric railway industry, while the bus revenues represent about 76 per cent of the total revenue of bus lines affiliated with electric railways. Practically all of the principal operating companies are included in the totals. The results are, therefore, entirely representative.

Combined operations of the industry's rail and bus lines showed total revenues of $791,835,096, which was a decline of 7.76 per cent from the $858,479,822 taken in for 1929. Viewed in the light of the recession in business generally, this is a remarkable showing, and reflects clearly the stability of the industry in the face of the most trying situation in a generation.

On the expense side of the statement the combined figure was $605,067,830, which is 4.66 per cent less than the cost of $634,627,120 for 1929. That this saving was not made at the expense of the service is seen from the statistics in Tables II and III, for the revenue car-miles were reduced only 3.67 per cent, and the revenue bus-miles actually were increased 5.81 per cent.

Despite the reduction in operating expenses, the net operating revenue fell to $186,767,266 from $223,852,702 for 1929, or 16.57 per cent. This brought the operating ratio up to 76.41 as compared with 73.92 for the year before, or 2.49 points.

Passing to the segregated figures for electric railways, Table II shows for 1930 a total gross revenue of $715,835,821, a reduction of $64,446,413, or 8.26 per cent. The revenues from bus undertakings, shown in Table III, were $75,999,275, which was a reduction from 1929 of $2,198,313, or 2.81 per cent. As to expenses, the rail lines decreased to $534,735,682 from $565,207,608, or 5.39 per cent, while the bus ex-

(Text Continued on Page 304)

Part I—Combined Operating Reports of 201 Electric Railways for the Calendar Year 1930 Compared With 1929

Table IV—Combined Income Statement*

	1930	1929	Increase or *Decrease*†		Cents per Car-Mile			
			Total	Per Cent	1930	1929	Increase or *Decrease*† Total	Per Cent
Railway operating revenue	$467,265,926	$518,438,682	*$51,172,756*	*9.87*	41.79	43.98	*2.19*	*4.98*
Railway operating expense, excluding depreciation	333,529,798	357,847,426	*24,317,628*	*6.80*	29.83	30.36	*0.53*	*1.75*
Net operating revenue	$133,736,128	$160,591,256	*$26,855,128*	*16.73*	11.96	13.62	*1.66*	*12.19*
Net revenue, auxiliary operations	4,582,322	4,739,022	*156,700*	*3.31*	0.41	0.40	0.01	2.50
Taxes	30,695,864	32,681,699	*1,985,835*	*6.08*	2.75	2.77	*0.02*	*0.72*
Operating income	$107,622,586	$132,648,579	*$25,025,993*	*18.87*	9.62	11.25	*1.62*	*14.49*
Non-operating income	12,149,757	12,473,728	*323,971*	*2.60*	1.09	1.06	0.03	2.83
Gross income	$119,772,343	$145,122,307	*$25,349,964*	*17.47*	10.71	12.31	*1.60*	*13.00*
Deductions from gross income	88,194,522	87,276,569	917,953	1.05	7.89	7.40	0.49	6.62
Net income before depreciation	$31,577,821	$57,845,738	*$26,267,917*	*45.41*	2.82	4.91	*2.09*	*42.57*
Depreciation	30,941,137	32,202,562	*1,261,425*	*3.92*	2.77	2.73	0.04	1.47
Net income after depreciation	$636,684	$25,643,176	*$25,006,492*	*97.52*	0.05	2.18	*2.13*	*97.71*
Operating ratio before depreciation, per cent	71.83	69.02	2.36	3.42	.....	.....	....	.....
Ratio, net income to operating revenue, per cent	0.14	4.95	*4.81*	*98.17*	.....	.....	....	.....

*The 201 companies included in Table IV and subsequent tables either operate railways only or if they do a joint railway, power and light business make a complete separation of their railway taxes and charges. Complete information on these companies, therefore, is given. †Decreases are indicated by *italic figures.*

Table V—Operating Revenues by Primary Accounts

201 Companies

	1930	1929	Increase or *Decrease*† Total	Per Cent
Transportation (total)	$454,400,884	$504,608,166	*$50,207,282*	*9.95*
Passenger	434,242,968	481,109,234	*46,866,266*	*9.74*
Mail	357,608	408,333	*50,725*	*12.42*
Express	1,519,825	1,825,595	*305,770*	*16.75*
Milk	66,649	96,912	*30,263*	*31.23*
Freight	16,764,059	19,576,584	*2,812,525*	*14.37*
Switching	654,228	790,111	*135,883*	*17.20*
Other transportation revenue	795,547	801,397	*5,850*	*0.73*
Other railway operations	12,865,042	13,830,516	*965,474*	*6.98*
Total railway operating revenue	$467,265,926	$518,438,682	*$51,172,756*	*9.87*

†Decreases are indicated by *italic figures.*

Table VII—Operating Statistics

201 Companies

	1930	1929	Increase or *Decrease*† Total	Per Cent
Passenger car-miles	1,073,643,980	1,130,947,187	*57,303,207*	*5.07*
Revenue car-miles	1,111,320,417	1,171,243,656	*59,923,239*	*5.12*
Total car-miles	1,118,072,583	1,178,824,805	*60,752,222*	*5.15*
Revenue passengers	5,605,874,725	6,316,638,721	*710,763,996*	*11.25*
Revenue transfer passengers	245,810,843	292,390,880	*46,580,037*	*15.93*
Free transfer passengers	1,260,965,307	1,370,358,310	*109,393,003*	*7.98*
Total passengers	7,168,069,947	8,040,873,482	*872,803,535*	*10.86*
Passenger revenue	$434,242,968	$481,109,234	*$46,866,266*	*9.74*
Passenger car-hours[1]	97,519,382	103,606,544	*6,087,162*	*5.88*
Revenue car-hours[1]	98,920,758	105,127,626	*6,206,868*	*5.91*
Total car-hours[1]	99,386,330	105,697,213	*6,310,883*	*5.97*
Miles of single track	21,163.75	21,701.39	*537.64*	*2.48*
Passenger cars operated[2]	23,601	24,895	*1,294*	*5.20*

†Decreases are indicated by *italic figures.* [1]Reported by 183 companies. [2]Average maximum number of passenger cars in service daily: Reported by 168 companies.

Table VIII—Significant Ratios Derived from Tables IV—VII

201 Companies

	1930	1929	Increase or *Decrease*† Per Cent
Railway operating revenue	$467,265,926	$518,438,682	*9.87*
Per mile of single track	22,079	23,890	*7.58*
Gross income	$119,772,343	$145,122,307	*17.47*
Per mile of single track	5,659	6,687	*15.37*
Passenger revenue	$434,242,968	$481,109,234	*9.74*
Per revenue passenger, cents	7.75	7.62	1.71
Per total passenger, cents	6.06	5.98	1.34
Per mile of single track	$20,518	$22,170	*7.45*
Per passenger car-mile	40.45c	42.54c	*4.91*
Per car operated[1]	$15,424	$16,088	*4.13*
Per passenger car-hour[2]	$3.83	$4.00	*4.25*
Revenue passengers	5,605,874,725	6,316,638,721	*11.25*
Per mile of single track	264,856	291,070	*9.01*
Per passenger car-mile	5.22	5.59	*6.62*
Per car operated[1]	192,691	205,098	*6.05*
Per passenger car-hour	52	55	*5.46*
Total passengers	7,168,069,947	8,040,873,482	*10.86*
Per mile of single track	338,696	370,523	*8.59*
Per passenger car-mile	6.68	7.11	*6.05*
Ratio, transfer passengers to revenue passengers, per cent	26.88	26.32	2.13
Revenue car-miles	1,111,320,417	1,171,243,656	*5.12*
Per mile of single track	52,511	53,971	*2.71*
Per car operated[1]	39,523	39,245	0.71
Per car-hour	9.53	9.44	0.95
Car-hours[2]	98,920,758	105,127,626	*5.91*
Per car operated[3]	4,066	4,039	0.67

†Decreases are indicated by *italic figures.* [1]Reported by 168 companies. [2]Reported by 183 companies. [3]Reported by 155 companies.

Table VI—Operating Expenses by Primary Accounts

201 Companies

Expenses	1930	1929	Increase or *Decrease*†		Cents per Car Mile			
			Total	Per Cent	1930	1929	Increase or *Decrease*† Total	Per Cent
Way and structures, excluding depreciation	$38,375,968	$42,234,803	*$3,858,835*	*9.14*	3.43	3.58	*0.15*	*4.19*
Equipment, excluding depreciation	34,113,721	36,958,436	*2,844,715*	*7.70*	3.05	3.14	*0.09*	*2.87*
Power, excluding depreciation	46,357,033	48,672,438	*2,315,405*	*4.76*	4.15	4.13	0.02	0.48
Conducting transportation	154,851,690	166,763,798	*11,912,108*	*7.14*	13.85	14.15	*0.30*	*2.12*
Traffic	2,486,858	2,580,932	*94,074*	*3.65*	0.22	0.22	....	.....
General and miscellaneous	57,399,568	60,761,084	*3,361,516*	*5.53*	5.13	5.15	*0.02*	*0.39*
Transportation for investment—credit	—249,297	—268,332	*19,035*	7.09	—0.02	—0.02	....	.....
Total operating expense, excluding depreciation	$333,529,798[1]	$357,847,426[2]	*$24,317,628*	*6.80*	29.83[3]	30.36[4]	*0.53*	*1.75*
Depreciation								
Way and structures	$8,689,818	$9,816,033	*$1,126,215*	*11.47*	0.78	0.83	*0.05*	*6.03*
Equipment	8,720,866	8,865,785	*144,919*	*1.64*	0.78	0.75	0.03	4.00
Power	2,034,046	1,949,944	84,102	4.31	0.18	0.17	0.01	5.88
Undistributed depreciation reported in operating expense	3,409,378	3,488,520	*79,142*	*2.27*	0.30	0.30	....	.....
Total depreciation reported in operating expense	$22,854,108	$24,120,282	*$1,266,174*	*5.25*	2.04	2.05	*0.01*	*0.49*
Depreciation reported as a deduction from net income	8,087,029	8,082,280	4,749	0.06	0.72	0.68	0.04	5.88
Total depreciation	$30,941,137	$32,202,562	*$1,261,425*	*3.92*	2.76	2.73	0.03	1.10

†Decreases are indicated by *italic figures.* [1]Includes $194,257 undistributed expense. [2]Includes $144,267 undistributed expense. [3]Includes 0.02 cent undistributed expense. [4]Includes 0.01 cent undistributed expense.

Part II—Combined Reports of 201 Electric Railway Companies Segregated by Type of Territory Served

Table IX—Income Statement

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
			Increase or *Decrease*†				Increase or *Decrease*†				Increase or *Decrease*†	
	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent
Railway operating revenue	$341,250,334	$371,704,170	*$30,453,836*	*8.19*	$30,771,295	$35,751,746	*$4,980,451*	*13.93*	$95,244,297	$110,982,766	*$15,738,469*	*14.18*
Railway operating expense, excluding depreciation	235,873,049	251,338,422	*15,465,373*	*6.15*	26,711,087	28,226,672	*1,515,585*	*5.37*	70,945,662	78,282,332	*7,336,670*	*9.37*
Net operating revenue	$105,377,285	$120,365,748	*$14,988,463*	*12.45*	$4,060,208	$7,525,074	*$3,464,866*	*46.05*	$24,298,635	$32,700,434	*$8,401,799*	*25.69*
Net revenue, auxiliary operations	294,217	52,926	241,291	455.90	225,184	217,057	8,127	3.74	4,062,921	4,469,039	*406,118*	*9.09*
Taxes	22,894,008	23,976,311	*1,082,303*	*4.52*	1,661,487	1,868,983	*207,496*	*11.10*	6,140,369	6,836,405	*696,036*	*10.18*
Operating income	$82,777,494	$96,442,363	*$13,664,869*	*14.17*	$2,623,905	$5,873,148	*$3,249,243*	*55.32*	$22,221,187	$30,333,068	*$8,111,881*	*26.74*
Non operating income	6,806,242	6,831,669	*25,427*	*0.37*	1,976,324	1,036,987	939,337	90.58	3,367,191	4,605,072	*1,237,881*	*26.88*
Gross income	$89,583,736	$103,274,032	*$13,690,296*	*13.26*	4,600,229	$6,910,135	*$2,309,906*	*33.43*	$25,588,378	$34,938,140	*$9,349,762*	*26.76*
Deductions from gross income	56,738,578	56,806,673	*68,095*	*0.12*	9,135,294	8,542,561	592,733	6.94	22,320,650	21,927,335	393,315	1.79
Net income before depreciation	$32,845,158	$46,467,359	*$13,622,201*	*29.32*	*$4,535,065*	*$1,632,426*	*$2,902,639*	.....	$3,267,728	$13,010,805	*$9,743,077*	*74.89*
Depreciation	22,121,628	22,892,896	*771,268*	*3.37*	1,492,053	1,522,798	*30,745*	*2.02*	7,327,456	7,786,868	*459,412*	*5.90*
Net income after depreciation	$10,723,530	$23,574,463	*$12,850,933*	*54.51*	*$6,027,118*	*$ 3,155,224*	*$2,871,894*	.....	*$4,059,728*	$5,223,937	*$9,283,665*	.....
Operating ratio before depreciation per cent	69.12	67.62	1.50	0.01	86.81	78.95	7.86	9.96	74.49	70.54	3.95	5.60
Ratio, net income to operating revenue, per cent	3.14	6.34	*3.20*	*50.47*	.....	.....	....	.....	....	4.71	....	.....

†Decreases or deficits are indicated by *italic figures.*

Table X—Operating Revenues by Primary Accounts

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
			Increase or *Decrease*†				Increase or *Decrease*†				Increase or *Decrease*†	
	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent
Transportation, total	$333,196,278	$363,062,097	*$29,865,819*	*8.23*	$29,066,323	$33,903,328	*$4,837,005*	*14.27*	$92,138,283	$107,642,741	*$15,504,458*	*14.40*
Passenger	332,095,351	361,871,713	*29,776,362*	*8.23*	18,683,049	22,226,777	*3,543,728*	*15.94*	83,464,568	97,010,743	*13,546,175*	*13.96*
Mail	63,578	120,672	*57,094*	*47.31*	85,035	80,756	4,279	5.30	208,995	206,905	2,090	1.01
Express	36,927	43,581	*6,654*	*15.27*	639,835	766,518	*126,683*	*16.53*	843,063	1,015,496	*172,433*	*16.98*
Milk	422	753	*331*	*43.96*	44,605	71,107	*26,502*	*37.27*	21,622	25,052	*3,430*	*13.69*
Freight	460,795	546,597	*85,802*	*15.70*	9,272,596	10,356,023	*1,083,427*	*10.46*	7,030,668	8,673,964	*1,643,296*	*18.95*
Switching	124,375	145,297	*20,922*	*14.40*	111,369	125,934	*14,565*	*11.57*	418,484	518,880	*100,396*	*19.35*
Other transportation revenue	414,830	333,484	81,346	24.39	229,834	276,213	*46,379*	*16.79*	150,883	191,701	*40,818*	*21.29*
Other railway operations	8,054,056	8,642,073	*588,017*	*6.80*	1,704,972	1,848,418	*143,446*	*7.76*	3,106,014	3,340,025	*234,011*	*7.01*
Total railway operating revenue	$341,250,334	$371,704,170	*$30,453,836*	*8.19*	$30,771,295	$35,751,746	*$4,980,451*	*13.93*	$95,244,297	$110,982,766	*$15,738,469*	*14.18*

†Decreases are indicated by *italic figures.*

Table XI—Operating Expenses by Primary Accounts

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
			Increase or *Decrease*†				Increase or *Decrease*†				Increase or *Decrease*†	
Expenses	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent
Way and structures, excluding depreciation	$24,273,951	$26,542,436	*$2,268,485*	*8.55*	$4,107,864	$4,150,470	*$42,606*	*1.03*	$9,994,153	$11,541,897	*$1,547,744*	*13.41*
Equipment, excluding depreciation	24,139,267	26,161,712	*2,022,445*	*7.73*	2,247,742	2,297,885	*50,143*	*2.18*	7,726,712	8,498,839	772,127	9.09
Power, excluding depreciation	32,549,314	33,821,993	*1,272,679*	*3.76*	3,687,854	3,787,580	*99,726*	*2.63*	10,119,865	11,062,865	*943,000*	*8.52*
Conducting transportation	116,483,168	124,637,063	*8,153,895*	*6.54*	9,636,176	10,449,648	*813,472*	*7.79*	28,732,346	31,677,087	*2,944,741*	*9.30*
Traffic	962,480	992,236	*29,756*	*3.00*	866,342	936,778	*70,436*	*7.52*	658,036	651,918	6,118	0.94
General and miscellaneous	37,413,237	39,154,475	*1,741,238*	*4.45*	6,239,189	6,695,982	*456,793*	*6.82*	13,747,142	14,910,627	*1,163,485*	*7.80*
Transportation for investment, credit	—142,625	—115,760	—26,865	23.21	—74,080	—91,671	*—17,591*	*19.19*	—32,592	—60,901	*—28,309*	*46.48*
Total operating expense, excluding depreciation	$235,873,049[1]	$251,338,422[2]	*$15,465,373*	*6.15*	$26,711,087	$28,226,672	$1,515,585	*5.37*	$70,945,662	$78,282,332	*$7,336,670*	*9.37*
Depreciation												
Way and structures	$5,229,808	$6,209,232	*979,424*	*15.77*	202,682	232,534	*$29,852*	*12.84*	$3,257,328	$3,374,267	*$116,939*	*3.47*
Equipment	5,792,887	5,821,738	*28,851*	*0.50*	808,419	834,423	*26,004*	*3.12*	2,119,560	2,209,624	*90,064*	*4.08*
Power	1,086,301	1,010,057	76,244	7.55	30,137	26,981	3,156	11.70	917,608	912,906	4,702	0.52
Undistributed depreciation reported in operating expense	3,409,378	3,488,520	*79,142*	*2.27*	....	....	....	....	....	....	....	....
Total depreciation reported in operating expense	$15,518,374	$16,529,547	*$1,011,173*	*6.12*	$1,041,238	$1,093,938	*$52,700*	*4.82*	$6,294,496	$64,96,777	*$202,301*	*3.11*
Depreciation reported as a reduction from net income	6,603,254	6,363,349	239,905	3.77	450,815	428,860	21,955	5.12	1,032,960	1,290,071	*257,111*	*19.93*
Total depreciation	$22,121,628	$22,892,896	*771,268*	*3.37*	$1,492,053	$1,522,798	*$30,745*	*2.02*	$7,327,456	$7,786,868	*$459,412*	*5.90*

†Decreases are indicated by *italic figures.* [1]Includes "Undistributed Expense" $194,257. [2]Includes "Undistributed Expense" $144,267.

Table XII—Operating Statistics

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
			Increase or *Decrease*†				Increase or *Decrease*†				Increase or *Decrease*†	
	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent	1930	1929	Total	Per Cent
Passenger car-miles	798,708,196	836,738,150	*38,029,954*	*4.55*	50,853,110	55,091,732	*4,238,622*	*7.69*	224,082,674	239,117,305	*15,034,631*	*6.29*
Revenue car-miles	800,892,499	839,504,697	*38,612,198*	*4.60*	72,303,218	76,527,870	*4,224,652*	*5.52*	238,124,700	255,211,089	*17,086,389*	*6.70*
Total car-miles	804,134,089	843,019,286	*38,885,197*	*4.61*	74,025,997	78,386,558	*4,360,561*	*5.56*	239,912,497	257,418,961	*17,506,464*	*6.80*
Revenue passengers	4,474,695,644	4,987,388,771	*512,693,127*	*10.28*	72,314,515	83,504,544	*11,190,029*	*13.40*	1,058,864,566	1,245,745,406	*186,880,840*	*15.00*
Revenue transfer passengers	232,847,467	277,292,221	*44,444,754*	*16.03*	74,770	75,413	*643*	*0.85*	12,888,606	15,023,246	*2,134,640*	*14.21*
Free transfer passengers	1,133,291,824	1,230,594,178	*97,302,354*	*7.91*	2,156,273	2,269,552	*113,279*	*4.99*	125,517,210	137,494,580	*11,977,370*	*8.71*
Total passengers	5,873,260,262	6,531,195,329	*657,935,067*	*10.07*	77,957,269	89,403,896	*11,446,627*	*12.80*	1,216,852,416	1,420,274,257	*203,421,841*	*14.32*
Passenger revenue	$332,095,351	$361,871,713	*$29,776,362*	*8.23*	$18,683,049	$22,226,777	*$3,543,728*	*15.94*	$83,464,568	$97,010,743	*$13,546,175*	*13.96*
Passenger car-hours	75,913,693[1]	80,211,006[1]	*4,297,313*	*5.36*	1,192,332[3]	1,321,658[3]	*129,326*	*9.79*	20,413,357[5]	22,073,880[5]	*1,660,523*	*7.52*
Revenue car-hours	75,972,803[1]	80,321,388[1]	*4,346,585*	*5.41*	2,064,382[3]	2,238,086[3]	*173,704*	*7.76*	20,883,573[5]	22,568,152[5]	*1,684,579*	*7.47*
Total car-hours	76,291,525[1]	80,730,000[1]	*4,438,475*	*5.50*	2,082,290[3]	2,258,401[3]	*176,111*	*7.80*	21,012,515[5]	22,708,812[5]	*1,696,297*	*7.47*
Miles of single track	10,574.51	10,688.72	*114.21*	*1.07*	3,278.66	3,400.55	*121.89*	*3.59*	7,310.58	7,612.12	*301.54*	*3.96*
Passenger cars operated	18,554[2]	19,306[2]	*752*	*3.90*	560[4]	624[4]	*64*	*10.26*	4,487[6]	4,965[6]	*478*	*9.63*

†Decreases are indicated by *italic figures.* [1]Reported by 108 companies. [2]Average maximum number of passenger cars in service daily: Reported by 98 companies. [3]Reported by 29 companies. [4]Average maximum number of passenger cars in service daily: Reported by 29 companies. [5]Reported by 46 companies. [6]Average maximum number of passenger cars in service daily: Reported by 41 companies.

penses increased to $70,332,148, or 1.31 per cent. The principal reason for this increase was the expansion of bus service referred to in a previous paragraph. The lines were extended to cover 644 additional miles of roadway, or 5.72 per cent. A certain portion of this expansion was for the replacement of rail lines which for one reason or another were abandoned.

It was not found possible to carry the combined operating statements farther than the determination of net revenue. Many of the properties are operated in conjunction with other utilities and the net revenues from the various departments are consolidated. These general statements, however, show the principal results of operation for the year and indicate clearly the situation confronting the properties.

For the purpose of following through the distribution

Table XIII—Income Statements in Cents Per Car-mile

	City Lines 112 Companies			Interurban Lines 40 Companies			Combination Lines 49 Companies		
	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or *Decrease*† Per Cent
Railway operating revenue	42.43	44.09	*3.77*	41.56	45.61	*8.88*	39.70	43.11	*7.91*
Railway operating expense, excluding depreciation	29.33	29.81	*1.61*	36.08	36.01	0.19	29.57	30.41	*2.76*
Net operating revenue	13.10	14.28	*8.26*	5.48	9.60	*42.92*	10.13	12.70	*20.24*
Net revenue, auxiliary operations	0.04	0.01	300.00	0.30	0.28	7.14	1.69	1.74	*2.87*
Taxes	2.85	2.83	0.71	2.24	2.39	*6.28*	2.56	2.66	*3.76*
Operating income	10.29	11.44	*10.05*	3.54	7.49	*52.74*	9.26	11.78	*21.39*
Non operating income	0.85	0.81	4.94	2.67	1.33	100.75	1.41	1.79	*21.23*
Gross income	11.14	12.25	*9.06*	6.21	8.82	*29.59*	10.67	13.57	*21.37*
Deductions from gross income	7.06	6.74	4.75	12.34	10.90	13.21	9.31	8.52	9.27
Net income before depreciation	4.08	5.51	*25.95*	*6.13*	*2.08*	......	1.36	5.05	*73.07*
Depreciation	2.75	2.71	1.48	2.01	1.95	3.08	3.05	3.02	0.99
Net income after depreciation	1.33	2.80	*52.50*	*8.14*	*4.03*	......	*1.69*	2.03	....

†Decreases or deficits are indicated by *italic figures.*

Table XIV—Operating Expenses in Cents Per Car-mile

	City Lines 112 Companies			Interurban Lines 40 Companies			Combination Lines 49 Companies		
	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or *Decrease*† Per Cent
Expenses—									
Way and structures, excluding depreciation	3.02	3.15	*4.13*	5.54	5.29	4.73	4.17	4.48	*6.92*
Equipment, excluding depreciation	3.00	3.10	*3.23*	3.04	2.93	3.75	3.22	3.30	*2.43*
Power, excluding depreciation	4.05	4.01	1.00	4.98	4.83	3.11	4.22	4.30	*1.86*
Conducting transportation	14.49	14.78	*1.96*	13.02	13.33	*2.33*	11.98	12.31	*2.68*
Traffic	0.12	0.12	......	1.17	1.21	*3.31*	0.27	0.25	8.00
General and miscellaneous	4.65	4.64	0.22	8.43	8.54	*1.29*	5.72	5.79	*1.21*
Transportation for investment-credit	—0.02	—0.01	100.00	—0.10	—0.12	*16.67*	—0.01	—0.02	*0.50*
Total operating expenses, excluding depreciation	29.33[1]	29.81[2]	*1.61*	36.08	36.01	0.19	29.57	30.41	*2.76*
Depreciation—									
Way and structures	0.65	0.74	*12.16*	0.27	0.30	*10.00*	1.36	1.31	3.82
Equipment	0.72	0.69	4.35	1.09	1.07	1.87	0.88	0.86	2.33
Power	0.14	0.12	16.67	0.04	0.03	33.33	0.38	0.35	8.57
Undistributed depreciation reported in operating expense	0.42	0.41	2.44	....	....	......	....	....	....
Total depreciation reported in operating expense	1.93	1.96	*1.53*	1.41	1.40	0.71	2.62	2.52	3.97
Depreciation reported as a deduction from net income	0.82	0.76	7.89	0.61	0.54	12.96	0.43	0.50	*14.00*
Total depreciation	2.75	2.72	1.10	2.02	1.94	4.12	3.05	3.02	0.99

† Decreases are indicated by *italic figures.* [1] Includes 0.02 cent undistributed expense. [2] Includes 0.02 cent undistributed expense.

Table XV—Significant Ratios Derived from Tables IX—XIV

	City Lines, 112 Companies			Interurban Lines, 40 Companies			Combination Lines, 49 Companies		
	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or *Decrease*† Per Cent	1930	1929	Increase or, *Decrease* Per Cent
Railway operating revenue	$341,250,334	$371,704,170	*8.19*	$30,771,295	$35,751,746	*13.93*	$95,244,297	$110,982,766	*14.18*
Per mile of single track	32,271	34,775	*7.20*	9.385	10,514	*10.74*	13.028	14.580	*10.65*
Gross income	$89,583,736	$103,274,032	*13.26*	$4,600,229	$6,910,135	*33.43*	$25,588,378	$34,938,140	*26.76*
Per mile of single track	8.472	9.662	*12.32*	1.403	2,032	*30.96*	3,500	4,590	*23.75*
Passenger revenue	$332,095,351	$361,871,713	*8.23*	$18,683,047	$22,226,778	*15.94*	$83,464,568	$97,010,743	*13.96*
Per revenue passenger, cents	7.42	7.26	2.20	25.84	26.62	*2.93*	7.88	7.79	1.16
Per total passenger, cents	5.65	5.54	1.99	23.97	24.86	*3.58*	6.86	6.83	0.44
Per mile of single track	$31,405	$33,855	*7.24*	$5,698	$6,536	*12.82*	$11,417	$12,744	*10.41*
Per passenger car-mile, cents	41.58	43.25	*3.86*	36.74	40.35	*8.95*	37.25	40.57	*8.18*
Per car operated	[1]$15,118	[1]$15,681	*3.59*	[2]$24,102	[2]26,230	*8.11*	[3]$15,609	[3]$16,397	*4.81*
Per passenger car-hour	[4]$3.92	[4]$4.05	*3.21*	[2]$6.26	[2]$6.75	*7.26*	[5]$3.62	[5]$3.92	*7.65*
Revenue passengers	4,474,695,644	4,987,388,771	*10.28*	72,314,515	83,504,544	*13.40*	1,058,864,566	1,245,745,406	*15.00*
Per mile of single track	423,159	466,603	*9.31*	22,056	24,556	*10.18*	144,840	163,653	*11.50*
Per passenger car-mile	5.60	5.96	*6.04*	1.42	1.52	*6.58*	4.73	5.21	*9.21*
Per car operated	[1]194,275	[1]206,646	*5.99*	[2]83,554	[2]90,955	*8.14*	[3]199,762	[3]213,428	*6.40*
Per passenger car-hour	[4]54	[4]57	*5.26*	[2]20	[2]21	*4.76*	[5]47	[5]51	*7.84*
Total passengers	5,873,260,262	6,531,195,329	*10.07*	77,957,269	89,403,896	*12.80*	1,216,852,416	1,420,274,257	*4.32*
Per mile of single track	555,417	611,036	*9.10*	23,777	26,291	*9.56*	166,451	186,581	*10.79*
Per passenger car-mile	7.35	7.81	*5.89*	1.53	1.62	*5.56*	5.43	5.94	*8.59*
Ratio,[9]transfer passengers to revenue passengers, per cent	30.53	30.23	0.99	3.09	2.81	9.96	13.07	12.24	6.78
Revenue car-miles	800,892,499	839,504,697	*4.60*	72,303,218	76,527,870	*5.52*	238,124,700	255,211,089	*6.70*
Per mile of single track	75,738	78,541	*3.57*	22,053	22,505	*2.01*	32,573	33,528	*2.85*
Per car operated	[1]36,379	[1]36,307	0.20	[2]95,900	[2]91,396	4.93	[3]45,486	[3]44,118	3.10
Per car-hour	[4]9.35	[4]9.27	0.86	[2]13.17	[2]13.14	0.23	[5]9.80	[5]9.69	1.14
Revenue car-hours	[4]75,972,803	[4]80,321,388	*5.41*	[2]2,064,382	[2]2,238,086	*7.76*	[5]20,883,573	[6]22,568,152	*7.47*
Per car operated	[6]3,923	[6]3,915	0.20	[2]7,377	[2]6,666	10.67	[8]4,504	[6]4,395	2.48

†Decreases[9]are indicated by *italic figures.* [1]Reported by 98 companies. [2]Reported by 29 companies. [3]Reported by 41 companies. [4]Reported by 108 companies. [5]Reported by 46 companies. [6]Reported by 94 companies. [7]Reported by 23 companies. [8]Reported by 38 companies.

of the various accounts where it is possible, Tables IV-VIII, constituting Part I of the statistics, were prepared from the statements of 201 electric railways. These companies either operate electric railways exclusively, or else separate the electric railway departments, so that the figures reflect the operations of rail lines alone. The New York rapid transit companies were excluded from these tables, since they furnish a special form of service, and the magnitude of the figures is such that they would overshadow all the others and so distort the results for the remainder of the industry.

Revenues of these 201 companies fell by $51,172,756 to $467,265,926, or 9.87 per cent below 1929. The analysis of the revenues by primary accounts given in Table V indicates that the miscellaneous sources of revenue, such as mail, express and freight, suffered more than the passenger business. This again is a measure of the recession of industrial activity, and indicates that the fundamental business of the electric lines, that of hauling passengers, suffered considerably less than the other departments.

Retrenchments amounting to $24,317,628 brought the total operating expense of this group down to $333,529,798, a decrease of 6.80 per cent. In other words, the savings accounted for almost one-half of the loss of revenue, so that the net was off only $26,855,128, or 16.73 per cent. While this was a serious loss, it must be remembered that operating expense had been reduced to some extent in 1929 and previous years.

Referring to Table VI, it will be seen that the greatest reduction was made in the conducting transportation account. The saving of $11,912,108 accounts for nearly half of the total. Other substantial savings of varying amounts were made in every department.

Operating statistics are given in Table VII, and significant ratios derived from them are shown in Table VIII. It will be noted that there was a gain of 1.71 in the revenue received from each paying passenger, the average fare being 7.75 cents. While there was a reduction of 5.12 per cent in revenue car-miles, the reduction in revenue car-hours was greater, being 5.91 per cent. This is equivalent to an increase in schedule speed, the car-miles per car-hour going up to 9.53 for the year. Greater use was made of the equipment actually operated, as both the car-miles and the car-hours per revenue car were increased for the year. This is remarkable in view of the reduction in car-hours and car-miles. It means that the companies were able to make greater use of the best of the equipment, and so retire the older and slower cars.

Part II of the survey is a further segregation of the accounts of the 201 companies by type of road. In this are included 112 companies operating city lines exclusively, 40 companies operating interurbans exclusively, and 49 companies with a combination of city and interurban or suburban lines which could not be separated. The city lines, which formed the largest group by far, made a much better showing than the others, revenues being down only 8.19 per cent as compared with a loss of 13.93 per cent for the interurban group and 14.18 per cent for the combination group. This difference must be taken in connection with the reduction in expense, which was 6.15 per cent for the city group, 5.97 per cent for the interurban group, and 9.37 per cent for the combination group. In net revenue the interurbans made by far the poorest showing, with a reduction of 46.05 per cent. As a group they showed a net deficit after depreciation amounting to $6,027,118, whereas the city group showed a net income of $10,723,530 after depreciation.

Further analysis of the accounts of the three groups of properties is made in Tables X to XV. In general, it will be seen that the figures are approximately parallel. Expenses per car-mile for the city properties amounted to 29.33 cents, for the interurbans 36.08, and for the combination systems 29.57. The car-mile costs varied but little from those for the preceding year. It is noteworthy that the amounts charged to depreciation were increased for all types of properties, showing that there was no tendency to skimp in this account in order to make a favorable showing.

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London Underground Tests Passengers' Honesty

LONDON subway passengers, on the whole, are an honest lot. As a result of one day's special observation at one of the biggest subway stations, Trafalgar Square Station, only five persons were caught trying to avoid payment of the proper fare. The Underground has been seeking to save time at a number of the busiest stations, including Trafalgar Square, by making them "open" stations. Passengers take their own tickets at automatic machines, and pass through without any examination being made at the barriers. Hitherto inspectors at the barriers punched all tickets as the passengers passed through.

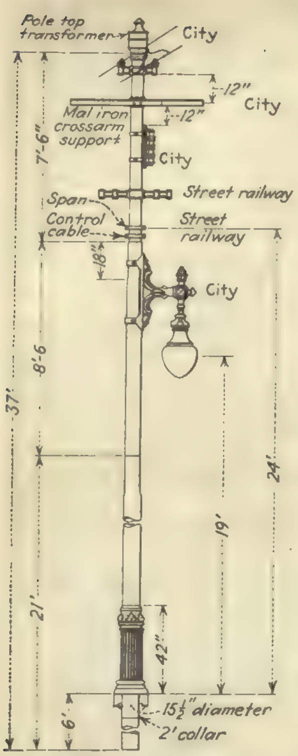
On the day of the test several inspectors were placed on special duty at the bottom of the escalators examining tickets. The five passengers caught cheating showed season tickets or return workmen's tickets entitling them to start their journey from the next station, and they should have taken another penny (2-cent) ticket on entering the station. At the bottom of the escalator they were given the choice of returning to the entrance and booking the penny ticket, or promising to pay the penny at the end of their journeys. All chose the latter alternative. They were followed and each left the station at the other end without paying. They were arrested and fined.

In commenting on the results of this experiment, an Underground official said:

> There is a tradition of fair-dealing among passengers, and this becomes obvious when you deal with millions of them, as we do every day. Of course there are always a few who won't play the game. But we have a system of inspection that quickly finds them out, and it would be absurd to do away with the automatic ticket machines because of those few people.
>
> The open-station system was first introduced with the starting of the escalators. The escalators made it simple for the passenger to get straight from the street to the platform level. They did not have to wait for the elevators. The ticket machines helped to solve the other difficulties—the difficulties of the heavy traffic at rush hours, the difficulties of handling the queues at the booking offices and of handing out change to thousands of people. The machines eased this situation. Regular travelers knew how much their tickets cost. It was simple for them to put their pennies into the slot and get the tickets for themselves. Then they could go straight down the escalator without queueing up at the booking offices.
>
> Even now, however, the stations are not really "open" ones. The tickets are still examined at the barrier, except on certain occasions when the ticket man is called away. And in addition to that we have our own methods of detecting frauds. The "open" system has been a success. More than 100,000,000 passengers per annum get their tickets from the machines. We could hardly stop the thing now because of a few black sheep.

Cincinnati Eliminates Unnecessary Poles

Co-operative planning by the city and various utilities has resulted in marked improvement in appearance of streets



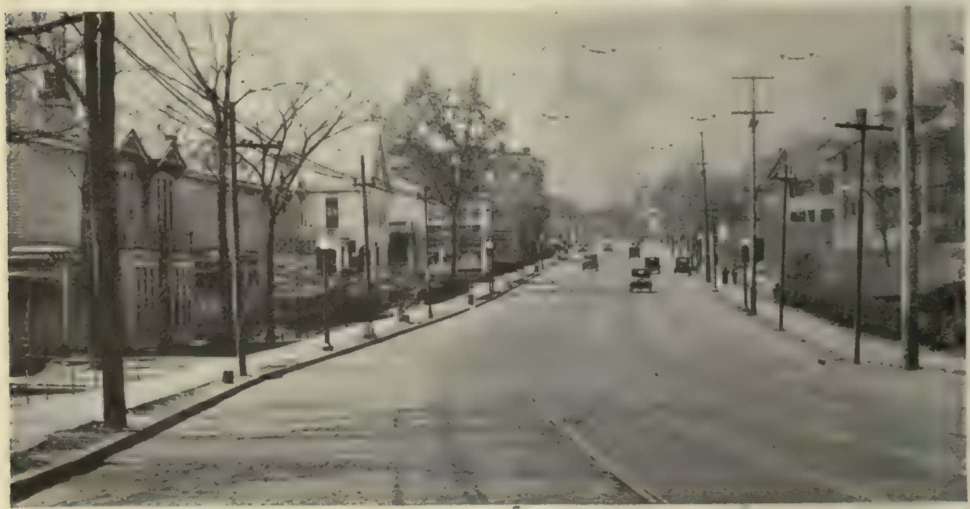
Standard 7-6-5-in. pole used jointly by Cincinnati Street Railway and city of St. Bernard

CO-OPERATION between the city, the street railway, and other public utilities has made notable progress in Cincinnati in recent years. Instead of each tenant of the street constructing its service lines independently of the city and of other companies, work of this character has been effectively co-ordinated. Engineers representing the various interests have been specially interested in ways to improve the appearance of the streets as well as their efficiency. This was particularly manifest in an effort to eliminate unnecessary poles. Under the sponsorship of Edgar Dow Gilman, director of public utilities, and R. J. Stock, electrical engineer of the department of public utilities, this has been done in many locations.

One of the most notable examples of this work was on Reading Road, one of the city's principal thoroughfares, extending northwardly connecting the downtown portion of the city with Avondale and Bond Hill, a portion of U. S. Highways 25 and 42. Previous to the improvement, there was a multiplicity of poles of various shapes and sizes, and uneven spacing along both sides of the thoroughfare. Some of the poles were iron, and some were wood. They were of different heights and diameters. There were also some boulevard light standards, and some traffic light standards. In many instances the boulevard lights were only 18 in. from a large diameter pole, which materially cut down the illumination to the street. Crossing the street overhead, were hundreds of service wires for house connections, as the secondary power and light wires were only on one side of the street.

When repaving was undertaken a short time ago, the plans called for the widening of the street, which meant that all the poles, boulevard light ducts, foundations, and cables had to be moved back to clear the new curbing. This involved the expenditure of a considerable amount of money on the part of the utility companies, as ordinances and contracts provide that the expense of such work be borne by them. It was felt that the appearance of the street could be improved by eliminating all of the unnecessary poles. The joint use of poles seemed to be the most satisfactory solution of the problem.

The plan adopted resulted in a single pole line on each side of the street, reducing by more than half the original number of poles along the thoroughfare. Iron poles were placed on one side of the street and wooden poles of "Black Jack" type opposite the iron poles on the other side. The railway feeders, a boulevard light wire, trolley span wires, and a three-insulator rack supporting secondary power and light conductors and an ornamental bracket equipped with an inverted boulevard light are carried on the iron poles.



Reading Road, Cincinnati, as it formerly appeared with separate poles for various purposes

Three-phase, 4,300-volt power lines, a boulevard light wire, a three-insulator rack supporting secondary power and light conductors, trolley span wires, and an ornamental bracket supporting an inverted boulevard light are carried on the wooden poles. Secondary power and light conductors on both sides of the street eliminate all conductors crossing the thoroughfare overhead for house connections.

Instead of using the same boulevard light glassware. which was a 16-in. diameter ball type and not very efficient, the lamps were equipped with Holophane dome refractors. The lighting fixture consists of an ornamental 36-in. cast-iron bracket, a cast-iron fixture with 6.6-amp. 2,500-lumen series lamp and dome refractor. The mounting height of the lamps is 16 ft. as against 12 ft. in the original installation. Practically all the light given from the lamps, neglecting that absorbed by glassware, etc., is used to light the street, whereas in the original installation, which consisted of the lamp and round glass mounted upon standards, much of the light was directed upward.

Other important streets improved in a manner identical to Reading Road included McMillan Street, prinicipal crosstown artery, from May Street to Peebles Corner, and Montgomery Road, highway leading from Walnut Hills through Norwood, Pleasant Ridge and Silvertown to Deer Park, a part of the State Route No. 3, on which unnecessary poles were eliminated from Lester Road to Woodmont Avenue. Another pole elimination was accomplished on Erkenbrecker Avenue, a crosstown street which connects the Cincinnati Zoological Garden with Burnet Avenue. The construction here differs from that on Reading Road, McMillan Street and Montgomery Road in that iron poles are used on both sides of the thoroughfares. This was possible because there were no 4,300-volt three-phase lines to be accommodated. In this installation the poles are all the same and, of course, present a somewhat better appearance than the other installations.

St. Bernard, Ohio, a thriving little city with a population of about 8,000, which is entirely surrounded by the City of Cincinnati, accomplished an excellent job of pole elimination on its principal thoroughfare at which time hundreds of useless poles were removed. Through contract and lease with the Cincinnati Street Railway, ornamental steel poles 37 ft. long, each pole having a cast iron ornamental base 42 in. high, were installed with equipment for all forms of service on the one pole line. This includes the boulevard lighting system, numerous electric service lines, high-tension wires, trolley and feed wires, fire alarm circuits and signal circuits. Telephone lines in St. Bernard are underground as in Cincinnati.

Each pole carries a 1,000 cp. lighting unit, spaced 100 ft. apart. This illumination, together with the elimination of the forest of poles and maze of overhead wires has transformed a dismal street into a whiteway thoroughfare. The special poles and equipment were designed by the Electric Railway Equipment Company. Each pole has a pole top current transformer and a four pin crossarm for the series boulevard light circuit. In order that every other lamp may be extinguished at midnight, the lamps are arranged on two different circuits. Directly below this crossarm is a four-spool Hubbard rack for distribution service. Below the Hubbard rack on one side of the street is a four-pin pressed-steel crossarm for the railway feeders, and directly below this crossarm is the span-wire collar, 24 ft. above the curb.

On some of the city's most important downtown streets, such as Fourth Street, poles have been entirely eliminated except for street lighting, as trolley supporting span wires are attached direct to buildings. For example, the new 48-story Carew Tower at Fifth and Vine, just completed, uses the span wire attachment plan.

Because railway operation in Cincinnati utilizes two trolley wires, the overhead construction must be more rugged than would otherwise be required. Despite the problem thus created, the program of pole elimination is progressing steadily and satisfactorily.

Section of East Fifth Street where span wires are attached directly to the walls of the Hotel Gibson

Improved appearance of Reading Road after installation of joint poles and elimination of those no longer needed

Condensed Financial Reports of Electric Railway Properties, 1930-1929

All Figures Are in Dollars, Unless Otherwise Indicated

	Auburn & Northern Electric R.R., Syracuse, N.Y.		Bamberger Electric Railroad, Salt Lake City, Utah.		Beaver Valley Motor Coach Co., New Brighton, Pa.		Beaver Valley Traction Co., New Brighton, Pa.		Boston, Worcester & New York Street Ry., Framingham, Mass.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	23,655	25,522	511,474	567,224	99,692	108,618	476,824	540,440	786,763	741,028
Railway operating expenses	25,725	27,427	450,221	453,392[1]	77,942	85,381	322,610	359,220	661,792	609,028
Net revenue, railway oper..	*2,070*	*1,905*	61,253	113,831	21,750	23,237	154,214	181,220	124,971	132,000
Taxes..................	2,187	2,225	36,500	....	1,010	577	3,724	4,303	18,320	18,294
Operating income.........	*4,257*	*4,129*	24,753	....	20,740	22,660	150,490	176,917	43,271[6]	71,408[6]
Non-operating income.....	47	54	4,249	....	4	6	2,709	2,905	4,176	12,816
Gross income.............	*4,209*	*4,075*	29,002	....	20,744	22,666	153,200	179,822	47,447	84,224
Deduct. from gross income.	....	....	95,420	....	14,243	14,852	177,169	175,801	37,537	55,408
Net income..............	....	....	*66,418*	....	6,500	7,814	*23,969*	4,020	9,909	18,816
Operating ratio..........	1,087	1.075	0.880	0.799	0.782	0.786	0.676	0.665	0.841	0.822

	California Street Cable R.R., San Francisco, Cal.		Chicago, Aurora & Elgin R.R., Chicago, Ill.		Chicago Motor Coach Co., Chicago, Ill.		Connecticut Co., New Haven, Conn.		Des Moines & Central Iowa R.R., Des Moines, Iowa	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	456,661	494,344	2,661,062	2,807,829	5,806,178	6,870,136	11,956,815	13,399,101	391,839	465,072
Railway operating expenses	426,696	432,936	2,390,834[1]	2,550,531[1]	4,088,032	5,373,967	9,086,521	10,546,907	392,261[1]	435,896[1]
Net revenue, railway oper..	29,965	61,408	....	....	1,718,146	1,496,169	2,870,294	2,852,194	....	....
Taxes..................	29,329	34,561	....	....	471,708	398,542	554,094	678,173	....	....
Operating income.........	635	26,846	270,228	257,298	744,587[6]	480,828[6]	2,316,200	2,174,021	*71,069*[6]	*42,472*[6]
Non-operating income.....	11,527	12,466	286,952	292,712	16,471	29,557	163,084	146,046	....	....
Gross income.............	12,162	39,312	557,180	550,010	761,058	510,385	2,479,284	2,320,068	*71,069*	*42,472*
Deduct. from gross income.	....	62	576,477	476,098	209,147	149,278	1,260,494	1,289,727	128,054	128,121
Net income..............	12,162	39,250	*19,297*	73,912	551,911	361,109	1,218,790	1,030,341	*200,123*	*170,593*
Operating ratio..........	0.935	0.876	....	....	0.704	0.782	0.759	0.787	....	....

	Des Moines Railway, Des Moines, Iowa		Empire State Railroad, Syracuse, N.Y.		Evanston Railway, Evanston, Ill.		Evansville & Ohio Valley Ry., Evansville, Ind.		Fonda, Johnstown & Gloversville R.R., Gloversville, N.Y.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	2,041,628	....	23,655	25,522	332,495	354,703	274,299	....	922,123	1,025,933
Railway operating expenses	266,389	....	25,725	27,427	215,398[1]	236,783[1]	246,038[1]	....	744,265	760,871
Net revenue, railway oper..	775,239	....	*2,070*	*1,904*	....	....	....	....	177,858	265,061
Taxes..................	168,000	....	2,187	2,225	....	....	....	....	57,640	70,775
Operating income.........	607,239	....	*4,257*	*4,129*	117,096	117,920	28,261	....	120,218	194,285
Non-operating income.....	....	....	47	54	....	....	....	....	87,152	122,767
Gross income.............	607,239	....	*4,209*	*4,075*	117,096	117,920	28,261	....	207,370	317,053
Deduct. from gross income.	713,005[8]	....	....	....	39,562	75,963	24,454	....	355,957	381,130
Net income..............	*105,767*	....	....	....	77,534	41,958	3,807	....	*148,586*	*64,077*
Operating ratio..........	0.620	....	1.087	1.075	....	....	....	....	0.807	0.74

	Harrisburg Railways, Harrisburg, Pa.		Holyoke Street Ry., Holyoke, Mass.		Johnstown Traction Co., Johnstown, Pa.		Lehigh Valley Transit Co., Allentown, Pa.		Lethbridge Municipal Ry., Lethbridge, Alta.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	1,482,178	1,628,222	567,074	703,745	988,054	1,083,724	3,803,254	4,220,636	53,817	62,206
Railway operating expenses	1,162,497[1]	1,152,999[1]	526,346[1]	618,709[1]	657,465[1]	732,599[1]	2,788,702[1]	3,022,681[1]	49,065	50,912
Net revenue, railway oper..	....	....	....	....	....	....	....	....	....	....
Taxes..................	....	....	....	....	....	....	....	....	....	....
Operating income.........	319,681	475,223	40,728	85,036	280,589[6]	301,125[6]	1,014,552	1,197,955	4,752	11,294
Non-operating income.....	82,136	78,237	23,136	24,429	....	19,741	196,321	177,942	....	....
Gross income.............	401,818	553,460	63,865	109,465	280,589	320,866	1,210,874	1,375,897	4,752	11,294
Deduct. from gross income.	296,901	303,931	82,234	82,605	203,480	196,800	770,256	873,693	310,17	31,020
Net income..............	104,917	249,529	*18,369*	26,860	77,109	124,066	440,618	502,204	*26,265*	*19,726*
Operating ratio..........	....	....	....	....	....	....	....	....	....	....

	Levis Tramways, Levis, P.Q., Canada		Lincoln Traction Co., Lincoln, Neb.		Market Street Ry., San Francisco, Cal.		Memphis Street Railway, Memphis, Tenn.		New York & Stamford Ry., New York, N.Y.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	159,959	173,361	420,117	474,997	9,196,340	9,590,194	2,652,932	2,915,090	0	1,362
Railway operating expenses	127,689[1]	134,161[1]	403,253[1]	415,779[1]	7,286,745	7,469,478	1,874,778[1]	1,997,052[1]	35,138	9,831
Net revenue, railway oper..	....	....	....	....	1,909,595	2,120,716	....	....	*35,138*	*8,469*
Taxes..................	....	....	....	....	556,000	595,000	....	....	4,942	3,931
Operating income.........	5,996[6]	12,587[6]	13,864	59,218	1,353,595	1,525,716	524,876[6]	918,038[6]	*40,100*	*12,400*
Non-operating income.....	1,410	1,384	3,717	2,139	20,523	22,522	861	792	148,772	137,140
Gross income.............	7,406	13,971	17,581	61,357	1,374,118	1,548,268	525,737	674,262	108,672	124,740
Deduct. from gross income.	6,583	12,397	44,047	48,194	1,195,212	1,255,783	550,652	528,343	127,951	132,144
Net income..............	823	1,574	*26,466*	13,163	178,906	292,485	*24,915*	145,919	*19,280*	*7,403*
Operating ratio..........	....	....	....	....	0.792	0.778	....	....	....	....

	New York State Rys., Rochester, N.Y.		New York Transportation Co., New York, N.Y.		Northampton Street Railway, Northampton, Mass.		Northern Texas Traction Co., Fort Worth, Tex.		Ohio Valley Electric Ry., Huntington, W.Va.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	7,578,955	9,126,524	6,299,767	6,730,730	176,494	217,983	2,181,865	2,514,379	541,817	650,298
Railway operating expenses	7,198,284	7,623,292	5,064,295	5,465,587	170,773	206,060	1,572,739	1,676,132	495,726[1]	548,735[1]
Net revenue, railway oper..	380,811[4]	1,503,197[4]	1,235,472	1,265,143	5,721	11,923	609,126	838,247	....	....
Taxes..................	531,743	571,136	523,915	519,611	....	....	162,316	165,696	....	....
Operating income.........	*150,932*	932,062	711,557	745,532	....	....	246,810[6]	472,551[6]	46,091	101,563
Non-operating income.....	118,138	105,341	219,535	234,175	....	....	64,348	156,700	....	....
Gross income.............	*32,794*	1,037,403	931,092	979,707	5,721	11,923	311,158	629,251	46,091	101,563
Deduct. from gross income.	1,472,928	1,501,390	8,175	8,250	8,569[1]	10,082[1]	240,684	336,081	115,689	117,981
Net income..............	*1,505,722*	*463,987*	922,917	971,458	*2,848*	1,841	70,474	293,170	*69,598*	*16,318*
Operating ratio..........	0.948	0.835	0.838	0.812	....	....	0.728	0.666	....	....

Condensed Financial Reports of Electric Railways, 1930-1929 *(Concluded)*

All Figures Are in Dollars, Unless Otherwise Indicated

	Oregon Electric Railway, Portland, Ore.		Pacific Electric Railway, Los Angeles, Cal.		Peninsular Railway, San Jose, Cal.		Peoples Motor Bus Co., St. Louis, Mo.		Peoples Railway, Dayton, Ohio	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	639,889	778,814	15,692,359	18,417,335	225,435	228,764	2,191,678	2,460,634	589,373	680,540
Railway operating expenses	1,180,063[1]	1,247,970[1]	13,989,913	15,499,320	292,413	264,201	1,949,426	2,141,258	454,659[1]	483,869[1]
Net revenue, railway oper..	....	....	1,693,446	2,918,014	*66,977*	*35,436*	242,252	319,376	....	....
Taxes..................	....	....	1,082,933	1,112,611	12,138	11,964	140,766	151,650	....	....
Operating income.........	*540,174*	*469,156*	610,512	1,805,403	*79,115*	*47,401*	101,486	167,726	100,876[6]	153,356[6]
Non-operating income.....	7,271	6,160	331,484	376,658	34,254	40,716	19,373	10,513	646	275
Gross income.............	*532,903*	*462,996*	941,996	2,182,061	*44,860*	*6,685*	120,859	178,239	101,522	153,631
Deduct. from gross income.	751,828	713,399	2,911,818	2,897,621	123	2,153	11,203	14,123	27,336	28,220
Net income...............	*1,284,731*	*1,176,395*	*1,969,821*	*715,560*	*44,984*	*8,838*	109,659	164,116	74,186	125,411
Operating ratio..........	....	....	0.895	0.841	1.297	1.111	0.889	0.878	....	....

	Petaluma & Santa Rosa R.R., Petaluma, Cal.		Philadelphia & West Chester Traction Co., Upper Darby, Pa.		Pittsburgh Motor Coach Co., Pittsburgh, Pa.		Pittsburgh Railways, Pittsburgh, Pa.		Portland Railroad, Portland, Me.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	520,278	511,069	1,156,832	1,238,174	1,014,608	887,072	18,758,598	20,258,007	1,208,078	1,252,291
Railway operating expenses	391,673	387,803	920,606	925,577	886,373	703,583	14,373,546	15,272,740	1,156,968[1]	1,090,493
Net revenue, railway oper..	128,605	123,265	236,226	312,597	128,235	183,488	4,385,052	4,985,267	....	161,798
Taxes..................	21,746	29,944	42,999	45,262	12,790	6,185	508,167	535,459	....	80,917
Operating income.........	106,858	93,321	193,227	267,335	115,445	177,303	3,876,885	4,449,808	51,110	80,881
Non-operating income.....	45,015	40,019	58,819	49,517	3,903	5,989	76,689	106,556	....	....
Gross income.............	151.873	133,340	252,046	316,852	119,348	183,292	3,948,113	4,556,374	51,110	80,881
Deduct. from gross income.	62,363	61,793	222,099	222,090	219,087	169,479	4,537,020[11]	4,540,469[11]	263,548	163,598
Net income...............	89,510	71,547	29,956	94,762	*99,738*	13,813	*588,906*	15,904	*212,437*	*82,717*
Operating ratio..........	0.753	0.758	0.796	0.747	0.873	0.793	0.766	0.754	....	0.871

	Rochester & Syracuse, R.R., Syracuse, N.Y.		San Francisco, Napa & Calistoga Ry., Napa, Cal.		San Jose Railroads, San Jose, Cal.		Second Avenue R.R., New York, N.Y.		Stockton Electric R.R., Stockton, Cal.	
	1930	1929	1930	1929	1930	1929	1930[2]	1929	1930	1929
Railway operating revenue	513,029	655,634	172,842	215,888	323,693	349,061	863,491	306,041	257,298	278,471
Railway operating expenses	569,842[1]	632,744[1]	146,807	166,562	266,431	293,199	872,726[1]	281,935[1]	215,013	227,480
Net revenue, railway oper..	....	....	26,034	49,325	57,261	55,862	....	....	42,284	50,991
Taxes..................	....	....	11,550	11,685	22,793	23,693	....	....	18,223	20,340
Operating income.........	*56,813*	22,890	14,484	37,639	34,467	32,169	*9,235*	24,106	24,061	30,650
Non-operating income.....	....	....	3,197	3,307	1,860	1,872	3,769	261	740	506
Gross income.............	*56,813*	22,890	17,681	40,947	36,328	34,041	*5,466*	24,367	24,801	31,156
Deduct. from gross income.	41,951	125,734	63,079	75,276	101,185	102,231	....	....	0	0
Net income...............	*103,764*	*102,844*	*45,397*	*34,329*	*64,856*	*68,190*	....	....	24,801	31,155
Operating ratio..........	....	....	0.849	0.771	0.829	0.840	....	....	0.832	0.817

	Tacoma Municipal Railway, Tacoma, Wash.		Toronto Transportation Commission, Toronto, Ont.		Trenton Transit Co., Trenton, N.J.		United Railways & Electric Co., Baltimore, Md.[7]		Visalia Electric R.R., Exeter, Cal.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	96,305	100,379	14,068,379	14,498,624	1,481,478	1,664,575	16,188,688	16,273,825	200,525	192,777
Railway operating expenses	119,992	88,561	9,008,602[1]	9,131,853[1]	1,200,370[1]	1,308,284[1]	10,796,439	10,885,708	93,521	99,832
Net revenue, railway oper..	....	....	....	....	....	....	5,392,249	5,388,117	107,004	92,945
Taxes..................	....	....	....	....	....	....	1,575,938	1,579,061	19,918	18,192
Operating income.........	*23,687*	11,818	5,059,776	5,366,770	281,108	356,291	3,816.291	3,809,056	87,085	74,752
Non-operating income.....	31,323	*1,911*	....	....	12,604	29,090	165,656	175,040	6,941	7,087
Gross income.............	7,636	9,416	5,059,776	5.366,770	293,712	385.381	3,981,947	3,984,097	94,026	81,839
Deduct. from gross income.	18,096	17,400	4,937,407	5,175,089	426.896	449,158	3,446,582	3,410,955	1,191[8]	454[8]
Net income...............	*10,460*	*7,493*	122,369	191,682	*133,184*	*63,777*	535,365	573,142	92,835[8]	81,384[8]
Operating ratio..........	1.246	0.882	....	....	....	....	0.666	0.667	0.460	0.511

	Washington, Baltimore & Annapolis Elec. R.R., Baltimore, Md.		West Penn Railways, Pittsburgh, Pa.		Winona Railroad, Warsaw, Ind.		Melbourne & Metropolitan Tramways Board, Melbourne, Australia		Central London Ry., London, England	
	1930	1929	1930	1929	1930	1929	1930[2]	1929[2]	1930	1929
Railway operating revenue	2,389,435	2,537,511	6,264,112	7,127,960	199,480	257,380	£2,349,154	£2,435,548	£502,498	£512,410
Railway operating expenses	2,346,138[1]	2,159,373[1]	3,290,107[1]	3,508,720[1]	202,738[1]	215,283[1]	1,658,830	1,704,678	314,041	332,576
Net revenue, railway oper..	....	....	....	....	....	....	....	....	....	....
Taxes..................	....	....	....	....	....	....	....	....	....	....
Operating income.........	43,297	378,138	2,482,649[6]	3,100,240[6]	*3,258*	42,097	690,234	730,870	188,457	179,834
Non-operating income.....	6,748	5,912	....	....	2,832	4,378	....	....	84,201	86,936
Gross income.............	50,045	384,050	2,482.649	3,100,240	*426*	46,475	690,234	730,870	272,658	266,770
Deduct. from gross income.	663,127	585,449	937,168	805,411	62,481	54,289	338,237	345,885	97,147	92,072
Net income...............	*613,082*	*201,409*	1,545,481	2,294,829	*62,906*	*7,814*	352,087	384,945	175,511	174,698
Operating ratio..........	....	....	....	....	....	....	....	....	....	....

	Underground Electric Rys., London, England		Christchurch Tramway Board, Christchurch, N.Z.		Hamburg Elevated Railway, Hamburg, Germany[9]	
	1930	1929	1930[2]	1929[2]	1930	1929
Railway operating revenue	£15,848,088	£15,097,592	£264,249	£276,689	67,573,240	68,108,807
Railway operating expenses	12,888,762[1]	12,288,229[1]	189,813[1]	196,522[1]	53,072,835	53,675,711
Net revenue, railway oper..	....	....	....	....	....	....
Taxes..................	....	....	....	....	....	....
Operating income.........						
Non-operating income.....	2,959,326	2,809,363	74,436	80,167	14,500,405	14,433,096
Gross income.............	1,028,586	1,080,003	....	....	144,548	126,412
Deduct. from gross income.	3,987,912	3,889,366	74,436	80,167	14,644,953	14,559,508
Net income...............	2,831,375[5]	2,738,940[5]	74,442	72,421	12,949,603	12,791,594
Operating ratio..........	1,156,537	1,150,426	*6*	7,746	1,695,350	1,767,914

[1] Includes taxes

[2] Year ended June 30

[3] Includes depreciation

[4] Includes auxiliary operations

[5] Includes dividends on guaranteed stocks

[6] After depreciation

[7] Revised statement

[8] Company owes Southern Pacific $1,051,381 on which no interest is being paid

[9] In reichsmarks

[10] Mar. 12, 1929 to June 30, 1929

[11] Includes 6 per cent return on capital investment

[12] Includes Pittsburgh & Beaver Street Railway

Trend of REVENUES *and* EXPENSES

PUBLICATION of earnings figures of leading companies covering an entire year is continued in this issue as a regular monthly feature. From these statistics it appears for the first time in several months that there is a fairly general trend toward a cessation of the large losses in revenue experienced each month since early in 1930. Besides this, the curtailment in expenses by practically all the companies listed has continued, so that in a number of instances there has been an actual gain in net income for the latest month over the corresponding period of last year. This is an indication that the business situation is at last growing less severe and is on the way toward recovery.

Abstracts of annual reports of 60 additional companies are given on pages 308 and 309.

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Boston, Revere Beach & Lynn R.R., Boston, Mass.					
3 mo. end Mar., 1931	271,067	246,997a	....	24,070	*11,149*
3 mo. end. Mar., 1930	280,550	256,500a	....	24,050	*11,987*
Boston, Worcester & New York Street Railway, Framingham, Mass.					
3 mo. end. Mar., 1931	....	....	....	*5,765*	*13,956*
3 mo. end. Mar., 1930	....	....	....	11,342	3,152
Cincinnati Street Railway, Cincinnati, Ohio					
April, 1931..........	664,131	426,468	57,504	206,071	17,778
Denver Tramway, Denver, Col.					
3 mo. end. Mar., 1931	920,724	648,644	113,282	171,405	49,960
3 mo. end. Mar., 1930	1,060,205	727,162	123,083	221,805	96,150
3 mo. end. Mar., 1929	1,088,420	726,359	124,035	250,348	120,951
3 mo. end. Mar., 1928	1,090,628	730,245	127,115	242,759	117,018
Des Moines Railway, Des Moines, Iowa					
March, 1931.........	163,662	110,958	14,000	38,703	*3,529*
March, 1930.........	188,316	....	....	....	....
April, 1931..........	158,393	109,884	14,000	34,509	*7,803*
April, 1930..........	173,461	....	....	....	....
Edmonton Radial Railway, Edmonton, Alta.					
March, 1931.........	69,539	47,087	....	22,451	21
March, 1930.........	77,239	47,472	....	29,766	2,539
3 mo. end. Mar., 1931	200,197	136,189	....	64,008	*4,281*
3 mo. end. Mar., 1930	238,390	146,412	....	91,978	7,638
April, 1931..........	62,707	46,218	....	16,488	*3,940*
April, 1930..........	66,384	45,298	....	21,086	*1,641*
4 mo. end. Apr., 1931	262,905	182,407	....	80,497	*8,222*
4 mo. end. Apr., 1930	304,775	191,710	....	113,064	5,996
Havana Electric Railway, Havana, Cuba					
3 mo. end. Mar., 1931	1,049,751	958,619a	....	92,686	*64,203*b
3 mo. end. Mar., 1930	1,356,063	1,148,840a	....	213,227	53,642b
Honolulu Rapid Transit Co., Honolulu, Hawaii					
March, 1931.........	86,308	50,797	7,744	28,917	18,462
March, 1930.........	89,848	53,790	8,819	28,423	16,309
3 mo. end. Mar., 1931	247,554	150,689	25,740	64,249	42,878
3 mo. end. Mar., 1930	259,325	160,079	26,458	76,161	40,393
April, 1931...........	84,244	51,294a	....	32,950	14,749
April, 1930...........	86,015	46,272a	....	39,743	18,296
4 mo. end. Apr., 1931	330,835	201,983a	....	128,852	57,627
4 mo. end. Apr., 1930	344,390	206,351a	....	138,039	58,689
Kansas City Public Service Co., Kansas City, Mo.					
3 mo. end. Mar., 1931	2,073,908	1,692,644a	....	381,264	115,887
Mexico Tramways, Mexico City, Mex.					
March, 1931..........	804,330	890,519a	....	*86,180*	....
March, 1930..........	877,870	901,730a	....	23,860	....
3 mo. end. Mar., 1931	2,269,230	2,594,600a	....	*325,370*	....
3 mo. end. Mar., 1930	2,491,460	2,637,830a	....	*145,370*	....
New York Railways, New York, N. Y.					
March, 1931.........	452,987	401,831a	....	51,156	13,549
March, 1930.........	461,704	427,031a	....	34,673	*27,246*
3 mo. end. Mar., 1931	1,280,207	1,398,383a	....	*118,175*	2,847
3 mo. end. Mar., 1930	1,330,128	1,415,695a	....	*85,567*	*101,442*
April, 1931...........	452,547	394,032a	....	58,515	10,346
April, 1930...........	453,266	414,223a	....	39,043	22,740c
4 mo. end. Apr., 1931	1,732,755	1,556,065a	....	176,690	22,195
4 mo. end. Apr., 1930	1,783,395	1,558,785a	....	124,610	124,183c
Schenectady Railway, Schenectady, N. Y.					
3 mo. end. Mar., 1931	362,462	312,281	24,694	26,818	*40,956*
3 mo. end. Mar., 1930	420,558	354,599	23,358	43,563	*22,215*
Twin City Rapid Transit Co., Minneapolis, Minn.					
3 mo. end. Mar., 1931	2,982,243	2,249,402	....	732,840	221,316
3 mo. end. Mar., 1930	3,579,496	2,539,930	....	1,039,566	....
Youngstown Municipal Railway, Youngstown, Ohio					
March, 1931..........	132,284	128,842	....	3,442	....
March, 1930..........	168,162	168,848	....	*686*	....

Italic figures indicate deficit. a Includes taxes. b Before depreciation.

c Before adjustment bond interest.

Trend of Revenues and Expenses by Months

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease PerCent*
Boston Elevated Railway, Boston, Mass.						
Apr., 1930.....	2,813,083	*3.54*	2,073,580	*0.96*	311,386	*21.80*
May...........	2,824,945	*5.17*	2,084,708	*2.50*	302,590	*25.51*
June..........	2,550,775	*3.93*	1,937,134	*3.05*	143,016	*36.53*
July...........	2,371,152	*5.04*	2,108,071	0.61	*167,529*	*489.94*
Aug...........	2,280,322	*7.81*	2,113,183	*1.55*	*274,728*	*163.79*
Sept...........	2,470,918	*3.78*	2,091,718	0.52	*59,868*	*200.31*
Oct...........	2,811,399	*4.04*	2,157,474	*1.29*	221,188	*31.30*
Nov...........	2,579,899	*10.34*	2,066,206	*2.56*	71,150	*77.85*
Dec...........	2,850,330	*8.20*	2,178,896	2.24	235,950	*56.62*
Jan., 1931.....	2,840,159	*8.43*	2,082,456	*6.23*	314,067	*30.56*
Feb...........	2,534,828	*8.33*	1,952,032	*5.23*	142,339	*48.27*
Mar...........	2,769,564	*7.30*	2,019,081	*4.92*	309,212	*29.08*
Apr...........	2,616,188	*7.00*	1,909,176	*7.93*	275,740	*11.45*
Brooklyn-Manhattan Transit System, New York, N. Y.						
Apr., 1930.....	5,074,571	23.82	3,578,817	23.35	802,168	51.14
May...........	5,229,829	21.65	3,600,727	22.46	929,201	35.36
June...........	5,070,028	21.64	3,591,743	21.59	776,745	28.77
July...........	5,003,577	*2.86*	3,608,741	*6.06*	720,302	18.55
Aug...........	4,727,623	*4.39*	3,558,841	*6.64*	465,144	*14.91*
Sept...........	4,834,251	*2.49*	3,453,431	*4.52*	667,323	6.20
Oct...........	5,036,775	*2.58*	3,572,553	*4.22*	758,817	2.78
Nov...........	4,769,083	*4.37*	3,366,923	*6.98*	689,470	2.34
Dec...........	5,065,484	*2.56*	3,546,963	*4.25*	814,788	2.04
Jan., 1931.....	4,852,706	*5.48*	3,475,330	*7.01*	674,029	*5.80*
Feb...........	4,453,655	*3.79*	3,159,903	*5.96*	583,468	2.40
Mar...........	5,028,562	*2.56*	3,475,847	*3.37*	814,360	*4.13*
Apr...........	4,969,481	*2.09*	3,458,940	*3.35*	804,235	0.25
Brooklyn & Queens Transit System, New York, N. Y.						
Apr., 1930.....	1,936,880	*3.18*	1,644,070	*7.55*	195,127	63.
May...........	2,030,966	*4.66*	1,615,294	*7.31*	310,865	9.11
June...........	1,968,238	*2.41*	1,603,996	*8.02*	257,482	18.78
July...........	1,917,118	*6.15*	1,603,893	*7.10*	203,433	*4.15*
Aug...........	1,827,238	*6.45*	1,595,256	*7.11*	120,864	*8.15*
Sept...........	1,887,499	*4.66*	1,564,271	*5.65*	213,728	*2.66*
Oct...........	1,922,388	*5.20*	1,597,166	*5.50*	214,924	*7.74*
Nov...........	1,820,498	*5.65*	1,522,735	*7.58*	187,822	5.20
Dec...........	1,920,463	*4.40*	1,560,950	*6.11*	250,893	6.06
Jan., 1931.....	1,849,644	*6.18*	1,541,235	*7.58*	197,355	3.02
Feb...........	1,704,677	*3.98*	1,416,192	*5.40*	176,217	2.58
Mar...........	1,941,078	*1.98*	1,602,862	*2.56*	227,472	1.21
Apr...........	1,911,878	*1.29*	1,592,919	*3.11*	208,514	6.86
Capital Traction Company, Washington, D. C.						
Apr., 1930.....	375,237	*1.51*	290,560	*1.54*	57,675	*15.73*
May...........	369,413	*5.11*	285,970	*3.10*	53,985	*16.72*
June...........	340,623	*5.25*	271,761	*3.80*	40,884	*16.70*
July...........	306,527	*9.02*	272,490	*4.65*	4,935	*78.13*
Aug...........	314,513	*3.48*	268,561	*4.09*	16,103	2.62
Sept...........	327,713	*7.06*	268,066	*1.61*	30,259	6.78
Oct...........	374,646	1.22	288,351	*1.48*	58,638	17.56
Nov...........	346,054	*2.70*	273,481	*1.54*	42,659	*11.05*
Dec...........	369,885	*1.77*	274,221	*3.21*	67,651	0.61
Jan., 1931.....	347,491	*3.06*	280,514	*3.30*	37,705	5.11
Feb...........	312,815	*3.47*	252,080	*5.88*	30,521	*1.87*
Mar...........	....	.....	....	.....	....	.....
Apr...........	....	.....	....	.....	....	.....
Chicago Surface Lines, Chicago, Ill.						
Apr., 1930.....	4,981,987	*7.42*	4,077,371	*2.02*	764,786	*10.75*
May...........	5,012,190	*6.39*	3,986,513	*4.11*	831,499	*7.91*
June...........	4,766,687	*6.89*	3,835,838	*4.49*	776,880	*7.48*
July...........	4,535,460	*10.05*	3,807,075	*7.10*	649,307	*19.05*
Aug...........	4,488,146	*12.20*	3,796,705	*8.06*	680,219	*15.82*
Sept...........	4,568,564	*9.50*	3,789,472	*4.40*	713,323	*12.94*
Oct...........	4,879,570	*10.79*	3,933,416	*7.35*	799,118	*11.69*
Nov...........	4,537,647	*13.48*	3,769,538	*6.86*	712,177	*20.77*
Dec...........	4,846,000	*8.09*	3,984,572	*9.89*	767,348	*15.67*
Jan., 1931.....	4,576,133	*12.65*	3,825,964	*5.37*	718,129	*21.00*
Feb...........	4,234,704	*10.90*	3,665,038	*6.04*	601,726	*15.44*
Mar...........	4,584,224	*4.35*	4,287,237	*5.34*	557,167	15.05
Apr...........	4,759,624	*4.46*	4,092,047	0.36	675,629	*11.66*

*Decreases or deficits are shown by *italic figures.*

Trend of Revenues and Expenses by Months *(Continued)*

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Department of Street Railways, Detroit, Mich.						
Apr., 1930	1,994,861	*14.80*	1,727,974	*12.47*	138,595	*44.59*
May	1,974,359	*16.21*	1,608,353	*17.80*	243,875	*10.54*
June	1,787,953	*18.50*	1,511,572	*14.43*	159,027	*46.43*
July	1,549,503	*27.41*	1,452,871	*14.20*	*41,888*	*113.55*
Aug.	1,516,209	*29.02*	1,426,941	*16.67*	*52,773*	*119.46*
Sept.	1,510,161	*26.36*	1,436,175	*12.59*	*51,711*	*115.40*
Oct.	1,579,476	*25.84*	1,458,238	*14.91*	22,933	*91.71*
Nov.	1,481,136	*23.35*	1,333,571	*13.38*	4,890	*98.14*
Dec.	1,610,179	*22.59*	1,440,503	*21.67*	23.052	*77.93*
Jan., 1931	1,550,656	*28.54*	1,421,575	*20.95*	12,759	*91.44*
Feb.	1,431,468	*25.58*	1,323,683	*18.96*	*28,309*	*117.91*
Mar.	1,696,308	*16.58*	1,415,021	*18.68*	133,347	*11.03*
Apr.	1,605,536	*19.51*	1,368,187	*20.82*	101,041	*27.10*
Eastern Massachusetts Street Railway, Boston, Mass.						
Apr., 1930	651,636	*9.02*	446,282	*3.06*	47,051	*53.03*
May	663,941	*7.87*	451,941	*8.04*	53,076	*34.20*
June	619,456	*9.64*	435,292	*6.43*	28,672	*58.48*
July	617,220	*10.11*	461,048	*7.27*	3,926	*91.22*
Aug.	624,332	*9.42*	444,429	*10.33*	28,399	*52.01*
Sept.	612,237	*7.12*	448,470	*0.88*	21,771	*70.76*
Oct.	623,872	*8.48*	467,773	*4.92*	15,811	*76.73*
Nov.	590,856	*10.90*	449,032	*1.60*	205	*97.62*
Dec.	670,964	*11.93*	516,913	1.71	20,841	*84.02*
Jan., 1931	700,961	*7.63*	472,079	*2.88*	36,145	*56.16*
Feb.	639,344	*6.62*	434,904	*2.83*	33,058	*50.86*
Mar.	685,614	*3.63*	472,317	*1.53*	28,982	*81.83*
Apr.	617,705	*5.21*	434,716	*2.59*	9,906	*78.95*
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.						
Apr., 1930	71,000	*13.68*	65,916	*5.54*	*21,343*	19.05
May	79,126	*6.80*	65,512	0.00	*13,182*	*32.16*
June	72,865	*15.19*	65,324	*25.80*	*12,940*	*172.80*
July	60,907	*21.02*	64,134	*11.58*	*24,217*	*110.22*
Aug.	64,592	*18.82*	62,484	*8.19*	*12,690*	*36.45*
Sept.	72,267	*11.61*	63,549	*5.42*	*8,497*	*436.09*
Oct.	75,708	*17.80*	66,353	*0.59*	*18,447*	*226.80*
Nov.	72,024	*13.82*	66,314	*0.23*	*21,171*	*158.25*
Dec.	....	.....	....	.....	....	.....
Jan., 1931	79,764	*15.78*	67,438	*7.38*	*13,133*	*236.77*
Feb.	74,018	*13.38*	62,239	*7.93*	*13,594*	*75.36*
Mar.	75,201	*7.83*	64,051	*7.61*	*13,965*	*5.28*
Apr.	70,660	*0.48*	62,685	*4.90*	*16.298*	23.64
Galveston-Houston Electric Railway, Houston, Tex.					†	†
Apr., 1930	41,348	*12.15*	27,417	*10.00*	*61,938*	*106.46*
May	41,686	*15.21*	27,945	*12.21*	*65,653*	*101.96*
June	45,659	*20.34*	28,273	*10.93*	*74,054*	*114.30*
July	46,757	*9.65*	29,248	*3.52*	*78,159*	*123.50*
Aug.	47,425	*11.42*	28,402	*8.12*	*82,135*	*146.25*
Sept.	42,823	*16.49*	28,052	*14.83*	*84,893*	*144.43*
Oct.	....	.....	....	.....	....	.....
Nov.	36,974	*12.49*	44,183	*9.58*	*93,685*	*127.12*
Dec.	36,166	*15.00*	27,949	*1.79*	*99,343*	*112.93*
Jan., 1931	33,291	*20.15*	25,057	*9.18*	*105,000*	*110.59*
Feb.	32,281	*19.80*	22,990	*9.64*	*111,369*	*110.17*
Mar.	32,904	*22.38*	24,732	*14.59*	*114,459*	*93.49*
Apr.	....	.....	....	.....	....	.....
Houston Electric Company, Houston, Tex.					†	†
Apr., 1930	261,403	*6.81*	188,034	*3.62*	615,008	3.38
May	262,653	*8.60*	194,968	*1.94*	597,837	*4.56*
June	247,461	*11.67*	179,084	*10.27*	589,240	*6.38*
July	247,070	*10.86*	176,909	*11.82*	584,163	*1.24*
Aug.	244,033	*12.41*	177,452	*10.89*	573,872	*4.18*
Sept.	251,919	*9.00*	175,905	*10.42*	571,857	*5.84*
Oct.	267,306	*7.57*	181,499	*10.67*	573,425	*4.16*
Nov.	247,210	*10.00*	176,739	*1.96*	550,635	*9.55*
Dec.	258,219	*9.84*	180,678	*0.68*	524,458	*16.64*
Jan., 1931	242,554	*10.52*	176,792	*11.08*	518,843	*17.70*
Feb.	223,256	*14.11*	163,249	*12.96*	507,328	*20.19*
Mar.	244,396	*10.97*	170,067	*12.70*	502,405	*19.39*
Apr.	....	.....	....	.....	....	.....
Hudson & Manhattan Railroad, New York, N. Y.						
Apr., 1930	1,063,729	*0.21*	515,470	*1.85*	213,380	9.06
May	1,039,637	*2.79*	509,707	*3.06*	194,759	*2.49*
June	989,627	*1.69*	499,396	*1.74*	154,985	*4.49*
July	954,538	*3.12*	502,515	*1.61*	116,747	*15.77*
Aug.	934,204	*5.65*	499,806	*3.98*	98,977	*26.27*
Sept.	974,433	*2.80*	506,845	0.23	132,332	*18.68*
Oct.	1,033,584	*4.33*	521,325	*1.97*	176,999	*17.79*
Nov.	994,735	*6.18*	489,761	*4.08*	169,465	*21.42*
Dec.	1,060,614	*4.66*	419,109	*17.40*	306,321	12.49
Jan., 1931	1,005,022	*7.62*	512,350	*7.23*	157,098	*21.78*
Feb.	936,542	*5.67*	467,137	*6.09*	134,717	*16.34*
Mar.	1,013,577	*6.05*	497,695	*6.34*	180,554	*15.13*
Apr.	1,002,265	*5.78*	485,938	*5.73*	181,182	*15.09*
Illinois Terminal Company, Springfield, Ill.						
Apr., 1930	590,334	*1.55*	423,704	*5.90*	131,438	19.13
May	608,403	*4.65*	427,471	*2.78*	142,226	*10.42*
June	566,548	*8.98*	444,638	0.00	86,421	*35.96*
July	601,515	*11.03*	475,856	*3.24*	87,602	*35.74*
Aug.	661,520	*7.65*	466,816	*12.07*	152,827	12.15
Sept.	654,477	*5.26*	454,818	*9.66*	160,897	14.62
Oct.	691,672	*2.54*	506,107	*2.41*	148,701	11.61
Nov.	542,672	*11.02*	430,907	*6.24*	80,529	*23.11*
Dec.	577,425	*13.69*	421,987	*14.26*	127,588	5.66
Jan., 1931	509,641	*20.77*	395,953	*19.80*	87,742	*9.83*
Feb.	498,067	*5.89*	388,126	*3.81*	84,381	2.26
Mar.	568,653	*1.95*	398,855	*5.94*	143,325	28.98
Apr.	....	.....	....	.....	....	.....

†Net income is shown for the preceding twelve months.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Interborough Rapid Transit Company, New York, N. Y.						
Apr., 1930	6,276,781	2.03	4,109,557	9.63	*161,201*	*126.53*
May	6,287,149	0.41	4,095,439	9.22	*144,798*	*122.44*
June	5,832,071	1.85	4,027,730	10.58	*218,727*	*348.57*
July	5,382,547	*1.53*	4,078,983	2.52	*521,582*	*73.64*
Aug.	5,183,166	*4.59*	4,121,083	5.06	*763,482*	*172.17*
Sept.	5,684,267	0.17	3,983,368	7.78	*131,270*	*206.26*
Oct.	6,315,679	*1.13*	4,162.660	*0.83*	161,417	207.14
Nov.	5,965,365	*4.96*	3,869,340	0.00	*272,021*	*121.79*
Dec.	6,477,864	*0.52*	4,194,315	3.96	*293,152*	*47.40*
Jan., 1931	6,123,645	*4.42*	4,538,833	10.83	*348,972*	*65.92*
Feb.	5,570,354	*3.27*	3,653,798	*2.10*	*321,587*	*10.36*
Mar.	6,293,013	*2.24*	3,973,704	*4.61*	*212,644*	*6.65*
Apr.	6,127,713	*2.38*	3,993,181	*2.83*	*189,134*	*17.33*
Jacksonville Traction Company, Jacksonville, Fla.					†	†
Apr., 1930	91,163	*6.41*	80,115	*7.57*	*65,138*	*39.46*
May	89,731	*9.29*	80,106	*7.92*	*66,663*	*39.81*
June	79,087	*12.73*	77,848	*7.08*	*71,399*	*41.50*
July	78,772	*11.02*	77,787	*11.27*	*70,688*	*35.34*
Aug.	77,441	*12.10*	78,177	*13.82*	*68,188*	*19.92*
Sept.	78,529	*9.54*	75,012	*11.15*	*66,335*	*8.16*
Oct.	84,424	*12.50*	76,374	*13.72*	*65,525*	*2.18*
Nov.	81,250	*12.24*	69,437	*16.02*	*62,599*	0.15
Dec.	89,903	*11.47*	74,836	*11.49*	*63,204*	*4.62*
Jan., 1931	87,160	*8.08*	77,998	*13.67*	*58,133*	11.98
Feb.	76,205	*15.60*	75,462	*28.14*	*77,874*	*23.42*
Mar.	84,018	*12.36*	77,758	*4.09*	*87,048*	*31.90*
Apr.	....	.....	....	.....	....	.....
Kansas City Public Service Company, Kansas City, Mo.					†	†
Apr., 1930	715,707	*4.85*	602,031	*0.50*	39,101	*36.99*
May	719,705	*5.03*	594,064	*1.49*	45,132	*41.06*
June	656,292	*8.03*	562,308	*4.19*	6,396	*84.76*
July	635,205	*11.09*	573,990	*2.92*	*21,365*	*144.42*
Aug.	622,554	*13.17*	530,094	*11.41*	15,479	*64.11*
Sept.	650,114	*9.99*	524,324	*12.12*	50,261	*1.32*
Oct.	725,428	*4.89*	700,311	12.90	*60,435*	*190.35*
Nov.	706,577	*5.29*	572,066	*7.04*	58,994	*5.69*
Dec.	758,045	*1.73*	570,065	*14.58*	108,444	*284.88*
Jan., 1931	....	.....	....	.....	....	.....
Feb.	....	.....	....	.....	....	.....
Mar.	....	.....	....	.....	....	.....
Apr.	710,719	*0.69*	565,328	*6.09*	71,298	82.34
Long Island Railroad, New York, N. Y.						
Apr., 1930	3,123,136	*3.33*	2,449,645	0.09	523,097	*15.87*
May	3,346,650	*6.25*	2,542,463	*3.10*	632,246	*18.11*
June	3,662,765	*4.22*	2,512,947	*3.06*	994,868	*4.62*
July	4,018,939	*5.76*	2,668,042	*3.56*	1,180,528	*11.19*
Aug.	3,968,936	*5.21*	2,635,376	*5.06*	1,152,651	*6.59*
Sept.	3,589,671	*7.33*	2,467,056	*7.07*	928,655	*6.58*
Oct.	3,371,761	*5.80*	2,446,346	*8.97*	729,067	1.77
Nov.	2,954,624	*4.20*	2,249,258	*14.56*	483.180	81.15
Dec.	2,905,045	*6.60*	2,130,182	*16.27*	596.812	47.11
Jan., 1931	2,763,421	*5.65*	2,210,263	*9.65*	321,141	*6.00*
Feb.	2,561,169	*7.43*	2,074,216	*9.13*	332,002	*3.86*
Mar.	2,841,915	*3.09*	2,234,418	*9.00*	449,501	24.64
Apr.	....	.....	....	.....	....	.....
Market Street Railway, San Francisco, Cal.						
Apr., 1930	798,970	*3.66*	637,121	*8.72*	76,480	10.99
May	792,536	*3.28*	675,407	*1.18*	61,527	*20.20*
June	743,277	*4.64*	646,615	*1.84*	42,297	*31.01*
July	735,453	*5.87*	649,901	*1.68*	32,534	*46.39*
Aug.	770,284	*6.69*	643,287	*5.46*	72,923	*16.56*
Sept.	745,298	*5.35*	626,770	*3.74*	64,731	*16.38*
Oct.	786,012	*6.73*	675,908	*6.49*	57,384	*45.58*
Nov.	729,407	*8.81*	615,613	*6.18*	60,457	*29.25*
Dec.	775.508	*5.12*	639,249	*5.52*	83,460	*0.03*
Jan., 1931	738,092	*5.55*	641,519	*4.83*	45,011	*12.31*
Feb.	668,931	*8.17*	576,661	*8.22*	41,002	*7.29*
Mar.	757,960	*6.40*	633,346	*6 81*	72,828	*0.05*
Apr.	745,252	*6.72*	620,106	*7.06*	73,837	*3.46*
New York, Westchester & Boston Ry., New York, N. Y.						
Apr., 1930	214,672	7.42	141,393	*10.06*	*158,947*	*0.98*
May	230,781	3.44	149,901	3.66	*148,173*	*7.86*
June	....	.....	....	.....	....	.....
July	224,469	*5.89*	146,233	*6.00*	*152,633*	*5.38*
Aug.	196,405	*10.53*	152,180	*0.41*	*184,982*	*22.45*
Sept.	203,617	*8.18*	165,256	6.57	*192,861*	*29.53*
Oct.	202,046	*7.52*	138,192	*14.09*	*190,748*	*20.81*
Nov.	184,690	*8.74*	170,542	2.52	*216,451*	*19.75*
Dec.	190,136	*12.31*	138,592	*17.80*	*205,029*	16.75
Jan., 1931	182,249	*13.76*	160,800	9.44	*220,394*	*32.37*
Feb.	161,311	*15.02*	149,571	*11.18*	*222,308*	*29.42*
Mar.	181,729	*12.80*	144,442	3.54	*195,802*	.....
Apr.	....	.....	....	.....	....	.....
Northwestern Pacific Railroad, Sausalito, Cal.						
Apr., 1930	434,145	4.04	482,221	*3.74*	55,856	18.36
May	485,027	*9.33*	482,698	5.49	2,800	*103.81*
June	504,138	*4.31*	448,510	*3.76*	42,824	*29.33*
July	597,419	*2.54*	392,575	*18.52*	195,195	55.38
Aug.	638,476	*11.48*	415,502	*18.64*	210,115	4.03
Sept.	548,282	*8.68*	471,657	*3.78*	16,471	*83.57*
Oct.	555,867	*18.49*	534,858	4.44	7,447	[illegible]
Nov.	333,193	*27.74*	421,717	*16.33*	97,567	*120.85*
Dec.	312,319	*20.77*	465,220	*3.46*	158,491	*74.63*
Jan., 1931	283,852	*21.78*	401,656	*14.41*	123,928	*14.76*
Feb.	273,818	*27.40*	387,512	*12.96*	*122,531*	*68.87*
Mar.	308,466	*24.17*	408,068	*14.43*	*109,855*	*48.81*
Apr.	....	.....	....	.....	....	.....

*Decreases or deficits are shown by *italic figures.*

Trend of Revenues and Expenses by Months (Concluded)

	Operating Revenue $ –	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
Staten Island Rapid Transit Company, New York, N. Y.						
Apr., 1930.....	198,184	*9.46*	169,662	*11.10*	34,026	476.60
May..........	214,848	*20.61*	176,605	*9.84*	25,183	0.00
June..........	224,980	*18.31*	178,999	*10.17*	30,052	*30.63*
July..........	243,991	9.78	189,173	39.19	41,021	*34.99*
Aug..........	233,371	*13.92*	168,110	*11.19*	49,486	*33.97*
Sept..........	206,908	*15.93*	165,525	*4.87*	26,127	*60.73*
Oct..........	205,631	*10.58*	167,586	*6.49*	29,723	*26.11*
Nov..........	178,652	*17.42*	161,608	*0.58*	10,788	*80.37*
Dec..........	178,474	*9.08*	160,715	47.29	5,997	*92.23*
Jan., 1931.....	170,387	*9.58*	158,982	*6.35*	*1,448*	*114.6*
Feb..........	161,415	*13.58*	142,565	*9.20*	2,151	*93.49*
Mar..........	173,723	*7.98*	159,035	*7.78*	*1,164*	*81.24*
Apr..........	....	.....	....	.....	....	.....
Third Avenue Railway System, New York, N. Y.						
Apr., 1930*....	1,236,554	*6.16*	1,026,448	*4.64*	12,657	1,461.90
May*..........	1,291,409	*6.92*	1,043,554	*7.63*	58,138	84.27
June*..........	1,244,961	*6.73*	1,018,619	*7.64*	45,078	1,056.24
July..........	1,429,730	*5.18*	1,212,311	*8.54*	2,066	106.36
Aug..........	1,350,064	*5.88*	1,180,853	*8.08*	*46,540*	28.34
Sept..........	1,428,136	*3.48*	1,167,528	*8.36*	45,636	277.91
Oct..........	1,456,688	*4.03*	1,205,455	9.73	36,257	317.06
Nov..........	1,373,335	*5.37*	1,146,168	*10.17*	12,079	130.15
Dec..........	1,438,752	*3.49*	1,197,249	*8.51*	26,250	186.44
Jan., 1931.....	1,393,054	*5.10*	1,178,797	*9.14*	*1,594*	96.33
Feb..........	1,274,832	*4.27*	1,070,307	*8.56*	*11,143*	*126.49*
Mar..........	1,418,429	*3.38*	1,174,984	*6.86*	27,364	430.88
Apr..........	1,408,235	*3.25*	1,155,880	*5.98*	44,331	250,25

*Excluding buses.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $	Increase or Decrease Per Cent*
United Electric Railways, Providence, R. I.						
Apr., 1930....	563,595	*7.82*	509,726	*0.65*	2,838	*93.98*
May......	569,925	.....	514,320	.....	5,602	.....
June.........	532,783	.....	478,197	.....	4,583	.....
July.........	513,367	*11.04*	458,817	*8.90*	5,480	*77.94*
Aug.........	495,723	.....	442,076	.....	3,643	.....
Sept.........	493,296	*12.72*	434,036	*10.39*	8,376	*72.04*
Oct..........	531,803	*13.76*	....	.....	41,223	*53.80*
Nov.........	506,318	*14.58*	439,930	*12.83*	16,958	*54.37*
Dec..........	559,363	*13.02*	460,420	*21.92*	51,623	889.51
Jan., 1931....	543,940	*13.39*	493,596	*12.94*	372	*95.68*
Feb..........	482,566	*14.30*	437,444	*13.02*	*4,503*	*150.71*
Mar.........	524,299	*10.44*	480,958	*9.38*	*6,233*	*265.73*
Apr..........	510,645	*9.39*	470,964	*7.60*	*9,992*	*455.60*
United Railways & Electric Company, Baltimore, Md.						
Apr., 1930.....	1,449,416	1.82	1,117,959	1.23	67,093	52.91
May..........	1,457,181	*0.42*	1,125,365	*0.52*	73,214	13.05
June..........	1,332,275	*2.63*	1,043,008	*2.92*	35,318	4.76
July..........	1,236,414	*6.91*	964,582	*6.24*	14,358	*59.85*
Aug..........	1,198,180	*8.34*	831,241	*18.41*	6,119	*71.42*
Sept..........	1,261,734	*6.71*	995,805	*5.02*	10,050	*75.81*
Oct..........	1,354,086	*7.28*	1,049,306	*4.84*	25,163	*71.16*
Nov..........	1,263,811	*10.26*	983,047	*7.40*	9,200	*87.30*
Dec..........	1,350,553	*8.19*	1,043,315	*7.25*	36,700	*54.54*
Jan., 1931.....	1,268,536	*10.90*	994,411	*11.89*	7,388	*69.22*
Feb..........	1,136,604	*15.78*	891,421	*15.97*	*24,088*	*231.15*
Mar..........	1,262,429	*14.90*	981,026	*14.76*	12,212	*84.94*
Apr..........	....	.....	....	.....	....	.....

*Decreases or deficits are shown by *italic figures.*

World's Largest Trolley Bus System at Shanghai

Latest type of trolley bus used in Shanghai, entering a typical narrow street

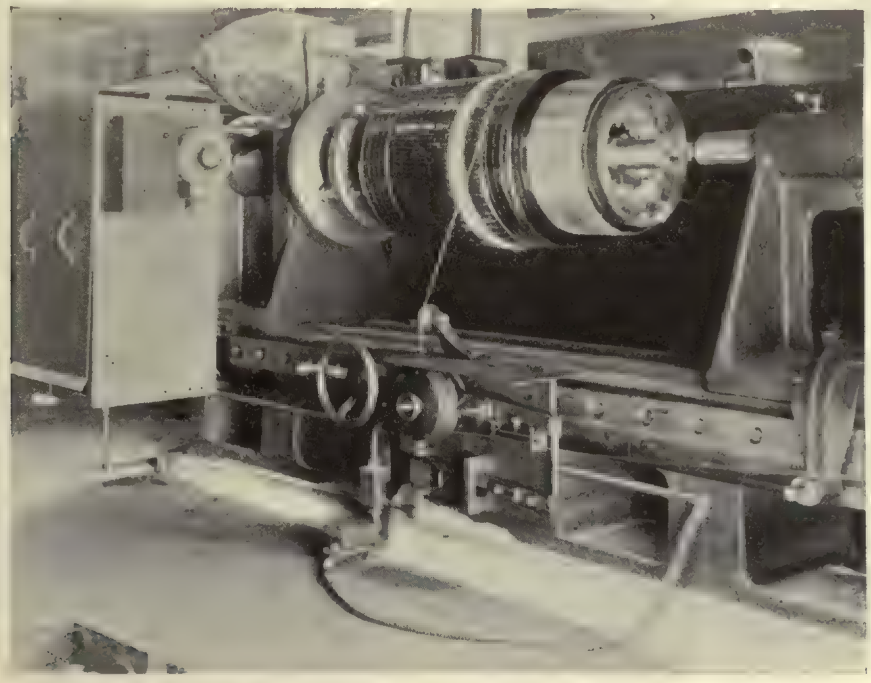
FOR several years the Shanghai Electric Construction Company, Ltd., in China, has held the distinction of being the largest operator of trolley buses in the world, having a fleet of 98 vehicles. When the latest order of the Chicago Surface Lines is delivered, however, the system there will have a total of 114 trolley buses, making it the largest.

Trolley buses were first introduced in Shanghai in 1915, when the company established a route 0.7 mile in length. After nearly six years of experience, extensions were authorized and several new vehicles were ordered. These were put into use in 1922. The chassis were manufactured by John I. Thornycroft & Company, Ltd., of England. The bodies were built at the Shanghai company's works. These vehicles are propelled by a single 40-hp. ventilated motor, supplied by the English Electric Company, Ltd. They are divided into two sections, the forward one-third being first class and the rear two-thirds being third class.

New routes and vehicles were added steadily thereafter until the present totals of 98 vehicles and 17.167 route-miles were reached. Street railway trackage in the city totals 17.968 miles. The railway has 101 motor cars and 100 trailers. During the year 1930 the company operated 2,869,693 trolley bus-miles and 5,839,244 car-miles. A total of 41,220,275 passengers were carried on the trolley buses and 87,344,680 on the street cars.

The trolley bus is being used on several heavily traveled streets which were too narrow for a double-track car line. The heavy pedestrian traffic in the streets, as well as the many carts and other odd vehicles, make the added flexibility of the trolley bus most desirable.

Practical MAINTENANCE *Ideas*



Band tension is held to close limits by this machine, which flashes a red light when tension is low, and a green light when tension is correct

BANDING ARMATURES

To Proper Tension

By **R. E. FERRIS**

Railway Engineering Department, Westinghouse Electric & Manufacturing Company

BANDING of railway motor armatures is of the first importance. Fundamentally, a band should have a reasonable factor of safety at overspeeds, and should be installed with not less than the maximum tension attained during overspeed. This will obviate actual band breakage, and prevent radial movement of the coils with consequent chafing of the insulation that may cause a short circuit. The centrifugal force tending to burst the band varies as the armature diameter and weight of coils and as the square of the speed. Hence the weight of the armature coil is important. Railway motor armatures invariably have coil supports, so the main point in determining banding tension is the type of winding, whether wire, ribbon or strap wound.

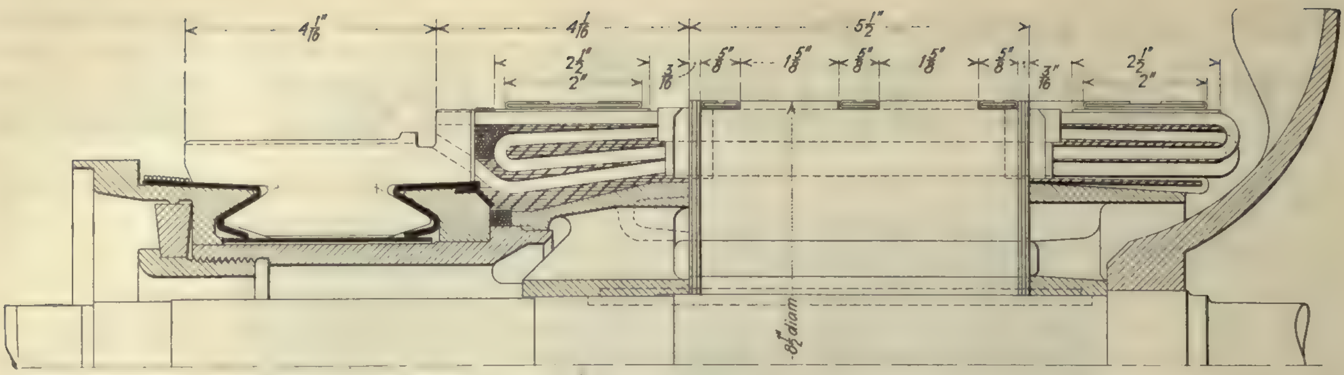
In order to pull the windings down without undue tension or pounding, it is advisable to band the armatures while hot, at a temperature of from 60 deg. C. to 80 deg. C.

Especially with wire windings, care must be used to see that the coils are not crushed, as otherwise short circuits may result. Filler pieces placed between the diamond part of the coil ends will prevent crushing. These pieces may be built into the coils, or may be put in place while the coils are being placed in the slots.

The band wire used should be uniform in strength and hardness. Its ultimate tensile strength should be not less than 200,000 lb. per sq.in., and its toughness such that it will bend 180 deg. flat upon itself without cracking or splitting.

It is desirable to pull the coils down with a temporary band while the armature is hot. This temporary band usually should be placed before the armature is dipped and baked, but an armature so constructed that it is difficult for the varnish to penetrate should be dipped and partially baked before the temporary band is put on.

After dipping and baking, the armature should be allowed to cool before the temporary band is removed. The permanent bands should then be put on cold and



Typical banding arrangement on an 8¼-in. armature

soldered. A thinned steel strip beneath the core bands is desirable. It may be insulated from the core by a strip of asbestos paper or asbestos cloth tape from 0.010 in. to 0.015 in. thick.

For some large armatures the core bands must be split to prevent undue eddy current losses. In making a split band, the wire should be continuous but the sections should be separated.

In soldering, the irons must have a temperature of not more than 350 deg. C., otherwise, the yield point of the band wire will be permanently lowered. Pure tin solder is recommended, especially on an armature which is to operate at Class B temperatures. Bands should be soldered all the way around, with tinned steel clips under both core and end bands to hold the wires together. On the cores the clips should be placed over the coils from 3 to 4 in. apart. The start and finish of each band should be held with a clip, and the end of the wire hooked over the edge of the clip.

Banding tension is quite important. The size wire, number of wires and tension for any given armature may be obtained from the manufacturer or may be calculated. The accompanying table gives recommended tensions for various band wires. It will be noted that 250 lb. is the maximum tension listed for wire or small ribbon. With a higher tension there is some danger that the coils may be crushed. Even with this tension it is sometimes necessary to use filler pieces. The number of band wires should be such that the maximum tension attained in service will be from 20 per cent to 30 per cent lower than that given in the table.

Banding Tensions for Various Wires

Diameter of band wire, inches	0.0285	0.0453	0.064	0.081
Tension in pounds:				
For wire or small ribbon coils	80	200	250	Not used
For large ribbon or strap coils	80	200	400	550

Definite instructions for banding armatures may be summarized as follows:

Preheating—Heat the armature for eight hours at 115 to 125 deg. C. Heating will be uniform at the rate of 1 in. depth of punching per hour.

Temporary Banding—Dipping and baking may be done if desired while the armature is still hot, after which it is drained and returned to the oven for a preliminary baking of from four to six hours before placing the temporary band. Usually armatures are dipped and baked after the temporary banding.

The temporary bands of at least two-thirds the number of turns used by the manufacturer or calculated for the permanent band should be put on the core and end windings within two hours after removing the armature from the oven. One or two layers of untreated duck strips slightly wider than the band will protect the windings. Band the entire armature in one operation without releasing the tension. Start on the core groove at one end of the armature. Continue toward the other end, including the end band; then proceed to the opposite end band. Each coil must be pulled down tight against the coil supports, avoiding arch binding. Now solder the band across its full width at the start and finish.

Permanent Banding—After treating, temporary banding, dipping, and baking, let the motor reach room temperature, and remove all temporary banding material.

Place the permanent band insulation and lay the proper number of clips on it keeping the clips and insulation in place with twine. Anchor the banding wire about the right end of the core by wrapping it upon itself and increase the tension to that given in the table. Then start the core bands, winding the required number of turns so each wire touches the adjacent one. After all core and end bands are in place, solder the ends of each, cut off the wire and form a hook at each end of each band so it will lie flat against the rotor and be not more than ⅛ in. long. Finally solder the entire band.

Repaired or Rebanded Armatures—Even with armatures banded as outlined, bands may loosen due to insulation shrinkage after service of a year or two. All new or rewound armatures should be examined after one to two years. Tapping lightly with a hammer will detect loose bands. If tight, a band should give a solid sound, and also no vibration between band and coils should be apparent by touch with the fingertips. With any looseness of the armature bands, the coils will move and chafe with final ground or short circuit. Sometimes the movement is so pronounced that the insulation is worn through and the copper exposed.

If there is any suspicion of looseness, the armatures should be rebanded, dipped in a good grade of insulating varnish and baked. The method of banding old windings does not vary greatly from that given. If the winding is very badly dried out, it may be desirable to reduce the tension somewhat from that given in the table. This reduction in tension, however, should not permit movement of coils due to centrifugal force.

◆

Repairing Broken Car Windows

"Emergency Sash for Broken Car Windows," published in the May number, page 262, was incorrectly credited to W. H. McAloney. John C. Burdett, Georgia Power Company, is the author.

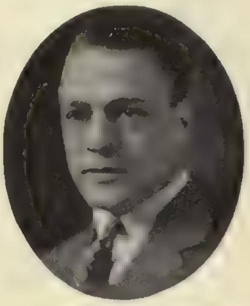
*Power Factor Regulation Reduces Penalty Charges**

By William J. Hankey
Assistant to Superintendent Power Conversion
Cleveland Railway

When the alternating-current load demand of the Cleveland Railway varies from unity power factor the railway must pay a penalty charge to the power company. To reduce the penalty charges to a minimum a study was made of the power factor conditions at each substation. As the alternating-current power is metered at the power company's end of the line, it was necessary to fix conditions at substations so that unity power factor would result at the sending end. The electrical characteristics of the cable and the conditions at each substation were investigated to determine the value of power factor necessary to result in a unity power factor at the sending end. The settings of the field rheostats on the synchronous converters were changed to bring about this result without appreciably lowering the efficiency at the substations.

As a result of the adjustment of power factor at the substations, the average system power factor at the sending end was increased from 99.16 per cent to 99.87 per cent, or an increase of 0.71 per cent. This increase represented a saving of $284 in demand charges for the first month the change was made. From November, 1926, when the readjustments were first made, to December, 1930, an average saving of $225 per month was made, showing a gross saving of $11,250 or a yearly saving of $2,700.

F. W. Drowley



Grayson S. Evans

John C. Burdett

Maintenance Contest Winners

for Second Period

F. W. Drowley
Toronto Transportation Commission
"Depressing Rail Lips at Track Drains"

Grayson S. Evans
Pittsburgh Railways
"Improved Current Selective Relay for Track Switches"

John C. Burdett
Georgia Power Company
"Emergency Sash for Broken Car Windows"

Farrell Tipton
San Diego Electric Railway
"Frame for Testing All Sizes of Bus Starters and Generators"

F. W. DROWLEY

When he was fifteen F. W. Drowley left the south shores of Ireland to begin his career in Canada. The Canadian Shipbuilding Company gave him his first opportunity. Later he joined other companies from which he obtained valuable experience in machine shop practice and drafting. In 1911 Mr. Drowley entered the service of the Toronto Railway Company as a trackman. In a short time he advanced through the positions of timekeeper, draftsman, general foreman and assistant superintendent. When the Toronto Transportation Commission took over the electric railways, he was appointed roadmaster.

Mr. Drowley served overseas in the World War with the First Battalion, Canadian Railway Troops.

• •

GRAYSON S. EVANS

Grayson S. Evans was born on Jan. 7, 1902, in Sharpsburg, a suburb of Pittsburgh, Pa. After graduation from the Carnegie Institute of Technology, Mr. Evans entered the service of the Duquesne Light Company in 1920, where he was assigned the duties of general meter maintenance. Three years later he accepted the position of superintendent of the meters and tests department with the United Electric Light Company, Wilmerding, Pa. When the United Electric Light Company consolidated with the Duquesne Light Company, Mr. Evans joined the power and inclines division of the Pittsburgh Railways. He has since been actively engaged in revising electric track switches and signal control apparatus.

• •

JOHN C. BURDETT

Before he journeyed to the neighboring city of Atlanta, John C. Burdett spent the years of his youth on a farm in Fulton County, Georgia, where he was born in 1882. During those early years he developed an ability for fixing things that would not work. When he reached manhood he decided to capitalize on his mechanical aptitude. In 1907 he left the farm and entered the service of the Georgia Railway & Electric Company, now the Georgia Power Company, as a mechanic. He is now in the body maintenance department.

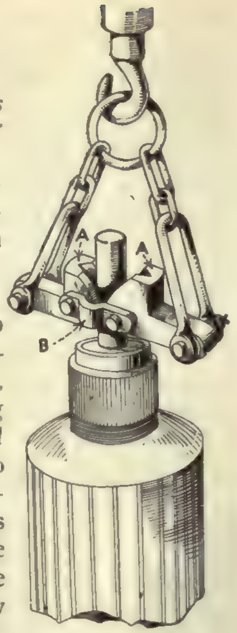
• •

FARRELL TIPTON

For the second consecutive period of the Maintenance Contest an award has been made to Farrell Tipton, electrician of the San Diego Electric Railway. A short detail of his career was published in the March number.

Sling Clamp

By Charles Willey
Superintendent Hoyts Electrical Works
Concord, New Hampshire



FOR the rapid handling of armatures about the shop, and especially for vertically dipping them into tanks of insulating compound the sling shown in the illustration i useful. The sling is made of two cam-action, V-faced clamping members, *A*, and two formed straps, *B*, joining them into a double-acting clamp. The clamping members *A* are of soft metal to avoid injury to the shaft. When hooked for hoisting the two levers cause the V faces to grip the shaft of the armature securely and without injury. The accompanying illustration shows how the clamp is used for hoisting armatures.

Improved Transportation of Welding Equipment

By F. J. Martin
Superintendent of Maintenance
Pittsburgh Railways

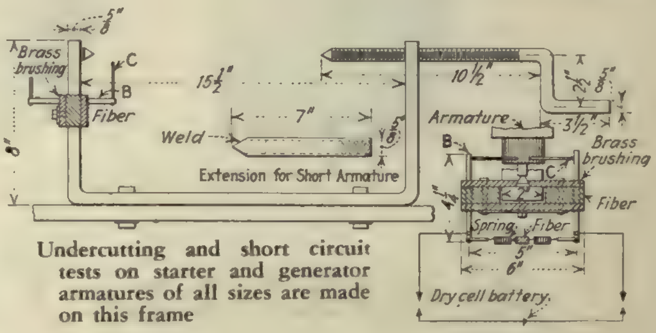
DELAYS in the transportation of electric welding equipment of the Pittsburgh Railways have been greatly reduced through the use of a special truck on which it is carried. Formerly, the equipment was moved from place to place on its own wheels, being hauled behind a work truck assigned to one of the track gangs. Difficulties frequently were experienced in obtaining the service of a truck, and its use for hauling the welding apparatus interfered with the work of the track gang. Moreover, in making a movement of this kind, consideration had to be given to the type of street traversed, since a speed exceeding 5 m.p.h. on a roughly paved street would be likely to shake the grinder to pieces. Thus, it often happened that only one location could be reached in an ordinary day's work, and several other spot-welding jobs were left undone.

Under the new arrangement the equipment is carried on a special truck. The outstanding feature of this truck is an overhead horizontal beam on which is operated a 1-ton chain block. This is used for lifting the grinding machine, weighing 1,800 lb., from the street onto the truck bed. The total time consumed in this operation does not exceed five minutes, and is handled by the two operators who form the crew. Space is also available for hauling the welding grid and other necessary welding material. After loading, a speed of 30 m.p.h. can be attained in moving to the next location. This allows two or more locations to be reached and the work completed in an eight-hour day.

Formerly electric welding equipment was moved from place to place slowly on its own wheels behind a regular truck. Now it is carried on this specially designed truck, which can move at high speed and thereby save much time

*Frame for Testing All Sizes of Bus Starters and Generators**

By Farrell Tipton
Electrician,
San Diego Electric Railway



Undercutting and short circuit tests on starter and generator armatures of all sizes are made on this frame

OVERHAUL of bus starters and generators consists of turning the commutator in a lathe, undercutting the mica and making a millivoltmeter test on the armature to detect short circuits. The undercutting and testing is done in a frame developed by the San Diego Electric Railway to facilitate this work. The frame is adjustable to hold the many sizes of armatures overhauled.

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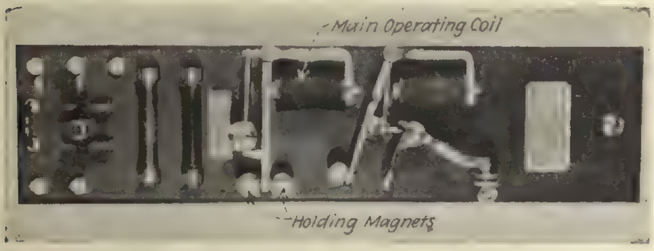
*Submitted in Electric Railway Journal *Prize Contest.*

After the armature is turned in the lathe it is placed in the frame, shown in the illustration, and is fixed firmly by turning the pivot at the right. An extension to the pivot is used for small armatures. The contact unit for the millivoltmeter test is lowered while the mica is being undercut. In making the millivoltmeter test, the contacts are raised and adjusted to the proper spacing on the commutator. The shaft carrying the contacts is set in a bronze bushing and can be moved one way or the other to fit the commutator. The contact points are rounded to prevent scratching of the commutator.

*Improved Current Selective Relay for Electric Track Switches**

By Grayson S. Evans
Pittsburgh Railways

PRIMARILY, two relays control an electric track switch. One, the power relay, limits the time during which current flows through the magnet. The other, the current-selective relay, directs the current to one of the two track magnets. The armature of the current-selective relay picks up or remains stationary, depending on whether the car passes the contactor with power or coasts through it. An adjustable weight varies the current required to pick up the armature. The relay has the disadvantages that the position of the armature may be changed when current is passing through it to the track magnet, and also that when the armature changes position under load it draws an arc from one contact and establishes a circuit to the other contact, thus energizing two magnets simultaneously and nearly doubling the current. When this happens, the power relay fails to open the circuit and the fuse blows. In addition, the switch will very often throw back. If the car is traveling at a good speed and the switch is set for the desired direction, the car may split the switch.



Small holding magnet prevents the reversal of switch direction while the car is passing through the pan

The new current selective relay has been devised to eliminate these hazards. It has a contact spacing of about 1/16 in. Two small holding magnets are located above and below the extreme end of the armature, so that the contacts are located in their magnetic circuit. When a circuit is closed in either position of the armature, the armature will not move until the power is off. If the passage of a car has started to operate the switch, and then some obstruction makes it necessary to stop, the switch will go through its cycle in the direction controlled by the initial impulse. This relay will permit faster movement of cars over the contactor. It will also eliminate trouble with heaters and pumps during the winter, and, what is more important, it will practically eliminate split switches that are caused by electrical defects in the relays.

Three of these relays have now been in service on the Pittsburgh Railways system for approximately six months at the most hazardous switch locations without a failure. There are about 230 electric switches in service, on which it is planned to replace the old-style selective relay with the new relay.

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*Submitted in Electric Railway Journal *Prize Contest.*

Tell the Judges of the

Electric Railway Journal Maintenance Contest

HOW GOOD A
MAINTENANCE JOB
YOU ARE DOING

Send in your data for the Company Award now

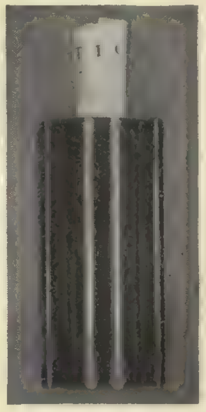
CLOSING DATE
JULY 1

Identifying Good Control Fuses

By W. R. McRae
Superintendent Rolling Stock and Shops
Toronto Transportation Commission

SERVICE delays frequently can be avoided if a spare control fuse is available. Failure to report changing of the fuse is one cause of trouble, and a flustered operator may fail to identify the good and bad fuses.

On the Toronto Transportation Commission cars this difficulty is obviated by placing two spare fuse holders at distinctly different locations in the front vestibule. One is cream colored for the good fuse, and the other is red for the defective fuse. Despite special instructions, routine inspections in the carhouses, and a weekly test of spare control fuses on the cars, occasionally a defective fuse in the "O.K." fuse holder is the cause of prolonging a delay.



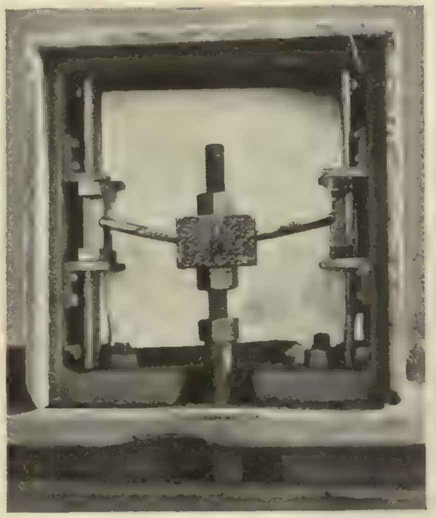
In Toronto good control fuses are marked with detachable gummed labels for quick identification

To avoid this possibility on the T.T.C., one end of each tested fuse is wrapped in a 2 x 4-in. label of the type illustrated, gummed at the bottom edge only. On the face is printed the statement that the fuse is good, along with the instruction to remove the label before using the fuse. The gum is so placed that the label does not adhere to the metal ferrule, and the difference in diameters of ferrule and cartridge forces out an edge or corner of the label so that quick removal is easy. Presence of the label indicates that the fuse is good, obviating the weekly test.

*Lock Box for Track Switches**

By James J. Burns

Road Master
City of Detroit, Department of Street Railways



This low-cost lock box has been found effective in Detroit

TRACK switches of the city of Detroit, Department of Street Railways, are locked by a simple device with practically no wearing parts. This device has been found to be very effective and reliable in its locking action. By adjusting the nuts on the pull-pin, it can be made to act as a two-way or a one-way throw device for spring switches. Under ordinary operation it is not possible to stop the tongue switch on dead center; the farther the collar on the pull-pin moves over the center, the tighter the switch is locked.

Between the jam nuts on the pull-pin is fitted a slot collar, into which are inserted short wedges of tool steel. The heels of these wedges rest in saddle blocks which engage flat springs, and are fixed between the guards. The ends of the flat springs rest on rectangular bars so that when the bars are turned on the high or on the low side the springs are placed in tension. As the construction of the locking box is so simple the cost has been reduced to about one-half that of the ordinary locking box. The maintenance required for this type of box is negligible.

*Depressing Rail Lips at Track Drains**

By F. W. Drowley

Roadmaster
Toronto Transportation Commission

REMOVAL of the rail lip at track drain castings was the cause of a number of broken rails. Although great care was exercised in the removal of the lip section by drilling a series of holes adjacent to the gage line, and marking a saw cut at each end of the section to be removed, as well as installing a welding plate for reinforcement, the breakage continued. By depressing the rail lip to make an even groove to the drains this trouble was eliminated. The depression was made by heating and forging the rail. Since this method was adopted no further trouble has been experienced.

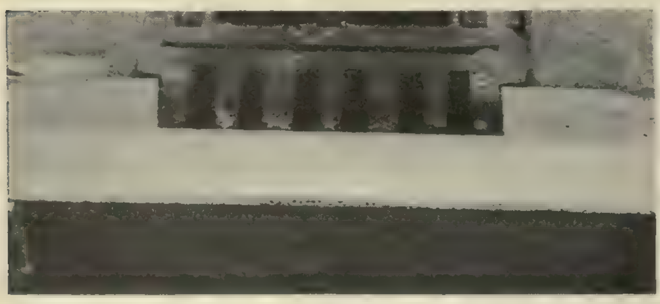
*Careful Maintenance Prevents Grounded Trolley Cables**

By R. W. James

Electrical Inspector
Ottawa Electric Railway

GROUNDING of the trolley cable between the fuse box and the line switch, and from the line switch to the controller gave us considerable trouble during the years 1928 and 1929. The source of the trouble appeared to have been at the end of the conduit pipes where the insulation showed a tendency to wear very rapidly. To stop this trouble we insulated all the cables at the ends of the conduit pipe by means of rubber and friction tape, and afterwards painting them with black insulating varnish. Large splashers were placed on the truck frames immediately in front of the cable outlets to prevent any water reaching the conduit pipes. Since we have installed the splashers we have found that whenever one is broken or damaged during the winter by rubbing on the icy ruts that have formed along the edge of the rails, the cable of that car will almost always ground soon after. Formerly, the largest number of grounded cables occurred during the winter months when water collected in the large deep ruts along the tracks, and was splashed on the cables causing them to ground. However, we are satisfied that this source of trouble has practically been eliminated since we have had only as many grounded cables in February and March, usually the worst months for such trouble, as we had during the summer months of July and August.

The almost complete elimination of grounded trolley cables has more than repaid for the extra maintenance work incurred in insulating the cables more thoroughly. As it is a great expense to renew these cables, a large saving has thus been made. A more important result is the elimination of interruption to car service. The great reduction in grounded cables has been extremely gratifying and may be indicated by a comparison of the records of the period before and after the improved maintenance. In the sixteen months prior to the inauguration of the improved maintenance method, 39 cars were taken out of service because of grounded trolley cables. In the following period of 33 months only four cars were out of service for the same cause.



Broken rails often resulted at drain castings where the rail lip was cut away

By depressing the rail lip to form a smooth groove to the drain broken rails at these points were eliminated

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**Submitted in* Electric Railway Journal *Prize Contest.*

Track in Somerville, Mass., restored to good condition after 30 years of service

Old Track Successfully Restored at SMALL COST

By H. M. Steward
Superintendent of Maintenance
Boston Elevated Railway

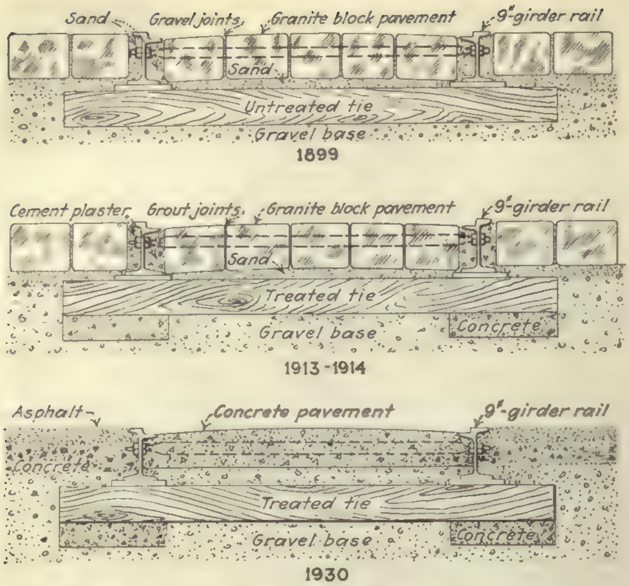
AFTER 30 years of service, surface tracks of the Boston Elevated Railway on Elm Street, Somerville, Mass., were recently restored to good operating condition at comparatively small cost. Restoration of the old track was considered preferable to the construction of entirely new track because the rapid transit line may be extended to this territory in the near future.

The track on Elm Street was built in 1899 with 95-lb. girder rail, Pennsylvania Steel Company section 222, with bolted joints and bonds. The rails were laid on wood ties 7 ft. in length, tamped with material then found in the street; paved with 8-in. granite blocks laid on gravel base with gravel joints.

In 1913-14, the city of Somerville laid a permanent paving in the roadways on both sides of the track, but the railway did not at that time rebuild its tracks, although they were from fourteen to fifteen years old. Instead, the tracks were simply relined and resurfaced, such ties as were necessary were renewed, and a concrete beam 4 in. thick and 18 in. wide was installed below the ties under each rail. The paving blocks were relaid with grouted joints, without a concrete base. The bolted joints were replaced by Lorain bar-welded joints.

The track remained in this condition for about fifteen years. Although occasional repairs to the rails and pavement were required, it remained generally in fair condition. In 1930, however, the city again decided to lay a new pavement in the roadways, this time with a concrete base and asphalt top, as the pavement previously installed had become worn out. Again the railway preferred not to build new track due to the possibility of rapid transit extension, in which event the surface tracks probably would become unnecessary and buses would be used.

First, the pavement was removed and a careful examination made of the concrete beams. They were found to be intact, and the ties which were firmly embedded in the concrete were in very good condition. It was necessary only to renew a small number of ties which were partially decayed. The track was relined and resurfaced where necessary wihout disturbing the concrete beams, by using shims and respiking the rails on the ties.



Cross-section of track as first built and as restored in 1914 and again in 1930

After the track had been brought to good line and surface, a concrete paving slab of a minimum thickness of 6 in. was installed between the rails of the track in place of the old granite block paving. The mixture used was 1 : 2 : 4 impregnated with 5 lb. of lampblack to every four bags of cement, to give the surface an appearance resembling the asphalt used elsewhere on the street. The top of the pavement in the center was brought to the height of the head of the rails, arching down to the flat tram of the rails.

Two Jackson tie tampers were mounted on a small push car and a puddler made of 6-in. channel iron, shaped to produce the cross-section desired, was attached to the tie tampers. This car was moved at the rate of 3 ft. per minute, and the tie tampers, operating at 3,600 strokes per minute, vibrated the concrete thoroughly, driving out all the imprisoned air, bringing the water to the surface, and causing the concrete to penetrate into all parts of the track structure between the rails. As the municipality installed a concrete base to support the asphalt pavement in the roadways and dummy, the rails which had then been 31 years in service were firmly anchored in the concrete.

An examination of the track, made after the winter of 1930-1931, showed that the track has remained true to line and surface, that there are no breaks or cracks in the concrete pavement, and no signs of heaving.

Checking Air Gap Clearances

By John S. Dean
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

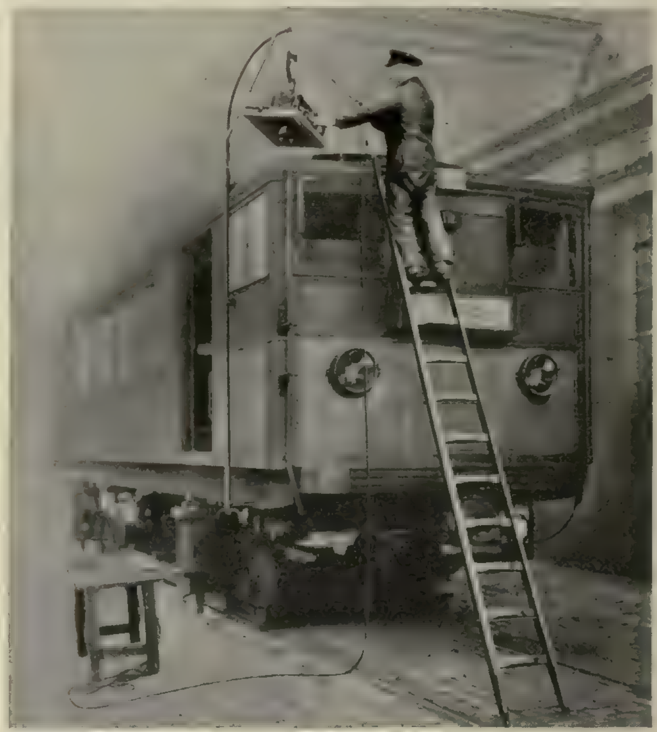
REPLACEMENT of field coils in box type motors necessitates removal of the poles, and when the new coils are installed care must be taken to get a good metal-to-metal contact between the pole and the machined seat in the frame to obtain a low reluctance path for the magnetic flux. The pole washer or spring should not be allowed to slip between the pole and the frame as it will prevent proper seating.

As a check on the assembly, a gage should be used after the poles are assembled and drawn tightly in place. Such a gage can be made from a round sheet-steel disk. The proper diameter is the diameter of the armature core plus twice the air gap. Failure of the gage to go inside the pole faces indicates that one or more poles have not been pulled up to proper position. Adjustment of the air gap is essential, as it affects motor speed.

Easy Installation of Roof Equipment*

By A. Hansmann
Master Mechanic
Hamburg Elevated Railway
Hamburg, Germany

EASY removal or replacement of the car circuit breakers that are installed on the roofs of the Hamburg elevated cars is made possible with the help of a device developed in the company shops. These breakers weigh about 60 kg. (130 lb.). Previously, the breaker was lifted up a ladder by one man, who stood on the car roof while another man pushed from beneath. Now it is possible for one man standing on a ladder, as shown in the illustration, to remove or install the breaker. A crane of steel pipe is hooked into the roof gutter while the bottom is clamped tightly to the side sill. At the top is a swinging arm carrying a pulley block at its end. The breaker to be installed is lifted from the floor with the pulley, swung into position and dropped in place. Removal is made in the reverse manner.

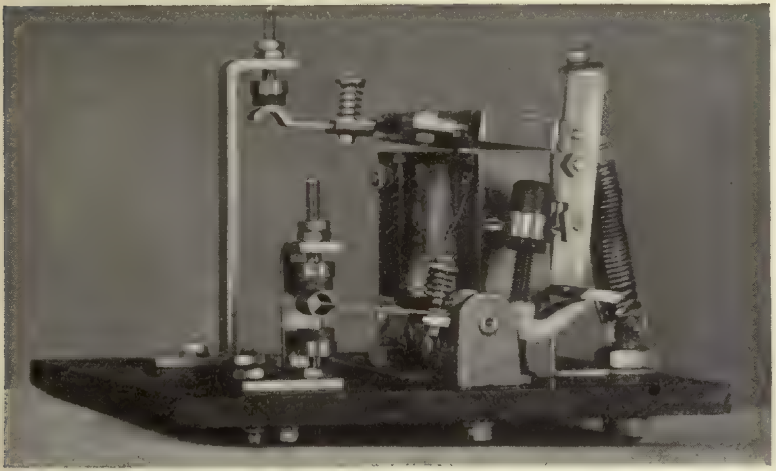


This light hand crane facilitates installation or removal of equipment on the car roofs in Hamburg

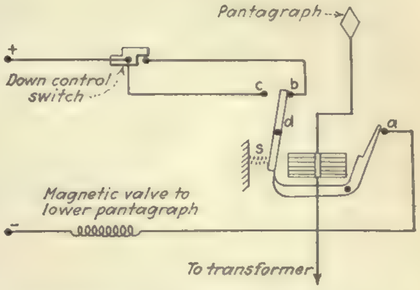
The device can be attached or taken down from any car by one man in two minutes. It cost 50 reichsmarks ($12) and weighs 25 kg. (55 lb.). Increased protection against accidents is assured.

**Submitted in* Electric Railway Journal *Prize Contest.*

NEW PRODUCTS *for Use by* the Railways



Pantagraph-lowering relay has been developed for cars or locomotives which do not have circuit breakers of large capacity



Pantagraph is lowered after the line is opened at the substation

Relay for Lowering Pantagraph on Line Interruptions

DUE to space limitations, it is unusually dangerous to install on an electric locomotive or car a circuit breaker having sufficient rupturing capacity to open the heavy currents which flow in case of a fault. Hence, the duty of interrupting fault currents falls to the breaker at the nearest substation. As the opening of a substation breaker entails a service interruption, it is important to isolate the faulty unit in the minimum time.

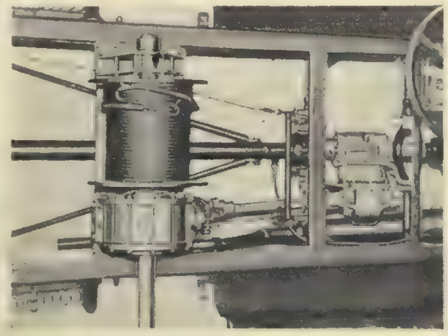
A locomotive or car can be isolated from the line by merely lowering the collapsible pantagraph from the trolley. This is usually accomplished by a magnetic arrangement which actuates a compressed air mechanism. However, under no conditions should the pantograph be disconnected from the line when fault current is flowing, as the heavy power arc would damage both the pantagraph and trolley.

A relay has been devised by the Westinghouse Electric & Manufacturing Company which will prevent the pantagraph from bing lowered until the substation breaker opens. The relay will operate the lowering mechanism the instant the fault current is interrupted, clearing the locomotive or car from the line before the substation breaker recloses. This relay consists of a rectangular core surrounding the high-tension lead and a pivoted metal piece which is arranged to operate a latch. In the diagram the circuit is shown under normal conditions, no fault current flowing. Actuating the pantograph "down" switch under this setting will lower the pantagraph from the trolley by energizing the magnet or valve.

However, should fault current be flowing the coil surrounding the high tension bus will be energized, and the metal piece will be attracted, breaking the contact at *A* which prevents the magnetic valve from being energized. The movable lever is unlatched, breaking contact at *B* and closing contact at *C*. As soon as the substation breaker is opened, fault current ceases to flow in the bus and the spring mechanism causes contact at *A* to be made. As contact *C* has been made previously, the down switch is thus bridged and the pantagraph will be lowered immediately upon the interruption of the fault, regardless of whether the "down" switch has been operated.

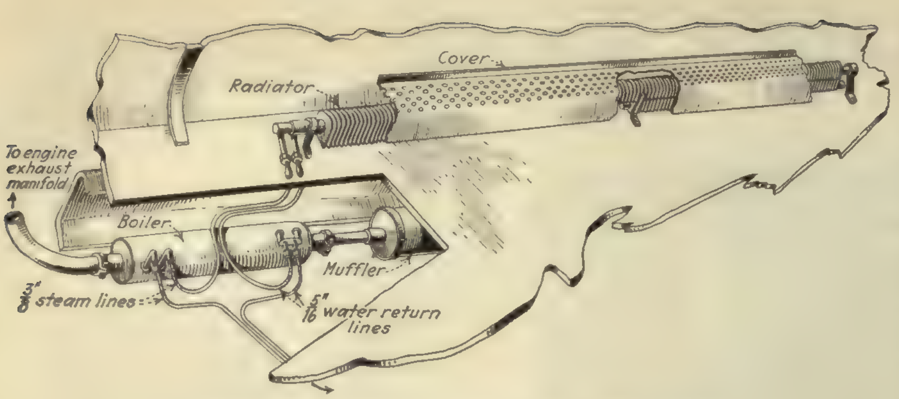
Service Truck for Line Work

EQUIPPED with a winch, and a truck body and chassis specially designed to stand heavy service demands, a truck has been built by the American Coach & Body Company, Cleveland, suitable for line construction service. In line pole construction the winch is capable of handling the largest sizes of poles.



View showing winch and transmission gear box

Power for the winch is supplied by the engine through a change-over box which is an addition to the regular transmission mechanism. The change-over box is built especially for this truck by the Ohio Gear Company, Cleveland. There are two positions of the shift lever. The first connects the engine to the winch, and the second position connects it to the regular truck propeller shaft and the rear differential. On the winch-drive side of this gear, power is transmitted through a silent chain and worm gearing to the drum itself. With this arrangement, it is impossible for the load to overhaul the winch by its own weight.



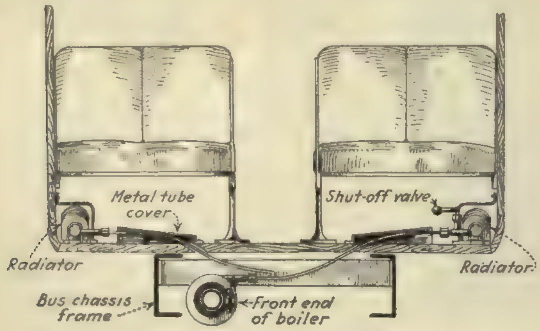
View showing boiler, one radiator and connecting lines

Steam Heater for Buses

EXHAUST gases form the source of heat in the steam-heating system for buses manufactured by the Foster-Vernay Corporation, Brooklyn, N. Y. The boiler, containing about one pint of water, is placed in the exhaust line anywhere between the muffler and engine manifold. Heat is transferred to the water through a coil of stainless steel, creating steam at a pressure of from 35 to 60 lb. per sq.in. The circulation of steam and condensate between the boiler and radiators is through copper connecting tubes. The radiators are placed under the seats, one running longitudinally along each side of the bus. They are covered with a perforated metal covering.

The boiler may be placed anywhere between the muffler and the engine manifold where it will be most convenient for the connecting lines. It is installed by cutting a section from the exhaust line 4 in. shorter than the over-all length of the boiler. This will allow the ends of the exhaust pipe to protrude 2 in. into the boiler. The boilers are provided for either right or left-hand exhaust pipes so that the standpipes will always face the center of the chassis.

Excepting for the "on" and "off" valves, there are no moving parts. It is not necessary to remove the heater in the summer; the heater will cease to function by merely turning the shut-off valve. Radiators can be obtained in standard lengths of 6 ft., 8 ft. and 10 ft. For standard installations, the length of the radiator is governed by the space available from the front seat to the front of the rear wheel housing. All boilers are tested with a pressure of 500 lb. per sq.in.



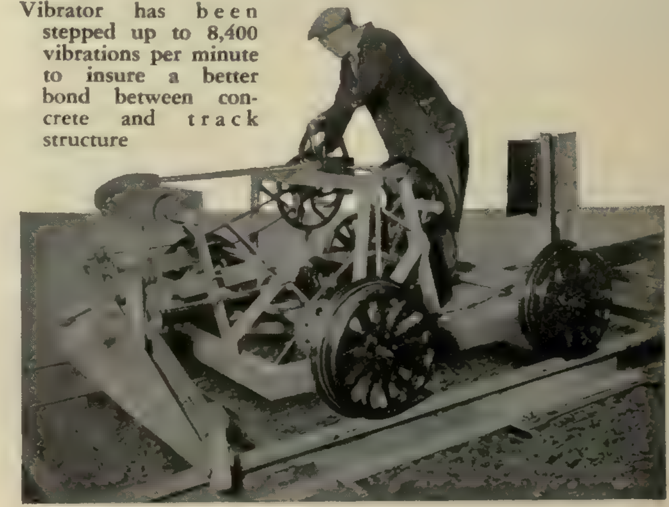
Front sectional view showing right-hand boiler installation

Improved Concrete Vibrator

SEVERAL improvements have been made in the machine, known as the Mortar-Flow Pulsator and manufactured by the International Steel Tie Company, Cleveland, for vibrating the track structure when pouring concrete in track construction. Improvements have been made in the lifting mechanism, in the detail of all keys, bolts and nuts which may be loosened by the vibration. This improved machine has worked on a 12-mile track without any difficulties.

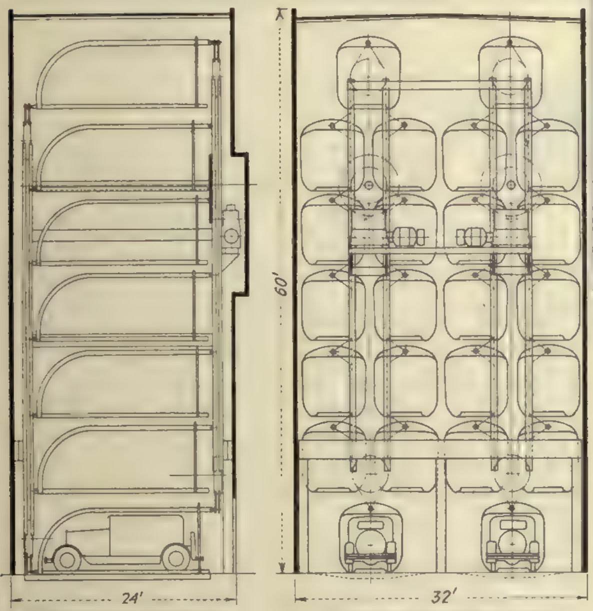
The motor speed has been increased from 1,800 to 2,100 r.p.m., giving a theoretical number of vibrations per minute of 8,400. The motors now furnished are completely inclosed as protection against weather and dirt. Special machines are available with speed regulation from 1,800 to 2,700 r.p.m. While the amount of pulsating force required to cause the concrete to flow efficiently into all voids and bond with the structure depends on the rail size, the depth of concrete and other factors, the usual work has been most successful at a motor speed of 2,100 r.p.m. or 8,400 vibrations per minute. It is claimed that the high frequency of vibration will not cause the track structure to move out of line or surface, or cause a segregation of the coarse aggregate in the concrete, because the 8,400 high frequency vibrations are not violent. It is impossible to tell whether the motor is in operation when standing at a distance of 15 ft. from the machine. The manufacturers recommend the machine for sealing and waterproofing the track structure, and for a better bond between the rail and concrete.

Vibrator has been stepped up to 8,400 vibrations per minute to insure a better bond between concrete and track structure



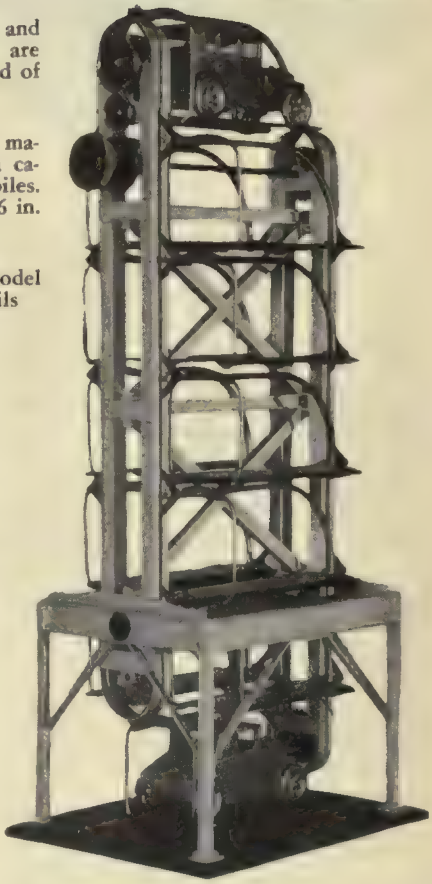
Automatic Storage for Automobiles

A Solution to the Parking Problem



Side Elevation Inside Walls

Front Elevation Inside Walls



Above — Individual cradles and an automatic control are features of this new method of storing automobiles

At left—A double parking machine; each machine has a capacity of twelve automobiles. Cradles can be made 3 ft. 6 in. shorter for smaller cars

At right—Hand-operated model showing construction details

PROMISCUOUS parking of automobiles on the streets is one of the causes of traffic congestion, which is resulting in great economic waste in the large cities. A practical and economical solution of the parking problem is extremely desirable. An important step in this direction is the automatic parking machine developed by the Westinghouse Electric & Manufacturing Company.

Consisting of individual cradles for each automobile, which are supported between two endless vertical chains driven by electric motors, one machine occupies a ground space of only 16x24 ft. and has a vertical height of 108 ft. Machines of smaller capacity are also made; for each pair of cradles removed a decrease of 8 ft. in height is effected.

The vertical chain travels at a speed of 100 ft. per minute, making the average time required to bring a cradle to the driveway level in a 24-car machine only 30 seconds..

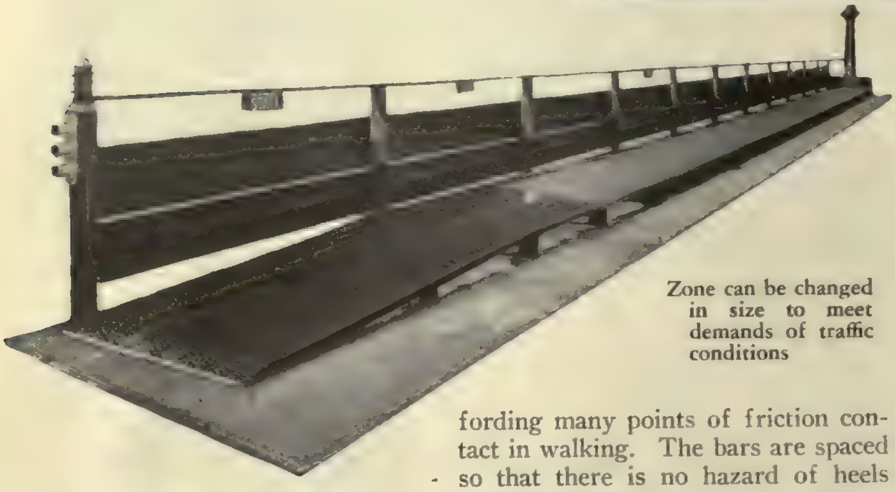
The machine can be operated by either of three methods, all of which use the same control but different master switches. A key system is best suited for garages where space is rented by the week or month. Each tenant has a key to call his cradle to the driveway level, by inserting it in the proper lock. When the cradle is at the driveway, the door can be opened with the same key.

A push button control system can be used in a public garage. When a customer wishes to park an automobile a dispatcher directs him to a machine and opens the door to the cradle. When the customer has stepped out of the inclosure he operates a lever to get his check. This lever stamps the check with the location of the car and the time of parking. At the same time the lever sets up the circuit that closes the doors and dispatches an empty cradle to the driveway level to receive the next automobile. When the driver returns for his car he presents his check to the cashier who collects the charge and pushes the button corresponding to the check number to bring the car to the driveway.

The coin system is similar to the push button system, except that a coin machine is used instead of push buttons. The driver deposits the coin which opens the door to an empty cradle for parking his car. He takes the check as a key, which enables him to call the cradle to the driveway level when he wishes his car. If he has overstayed his time additional money must be deposited to obtain the car.

Portable SAFETY ZONE

Safety zones have been placed along Fort Street, Detroit



Zone can be changed in size to meet demands of traffic conditions

PORTABLE safety zones for the protection of passengers getting on or off street cars at busy street intersections have been developed by the Blaw-Knox Company, Pittsburgh, Pa. The zone is entirely structural, having pipe or I-beam posts set into the pavement to which are anchored I-beam base members, splash plates and guard rails. Channels supported on the I-beam members contain fitted panels of electro-forged, one-piece, non-slip grating with a ramp to afford an easy grade for entering the zone. The entire platform is 8 in. above the street level. The zone is open only at the street-intersection end, the traffic end being properly buttressed to avoid danger from incoming traffic, and equipped with signal or warning lights.

The zone can easily be removed to another location, taken up temporarily to open the street for construction work, or changed in size according to the demand of traffic conditions.

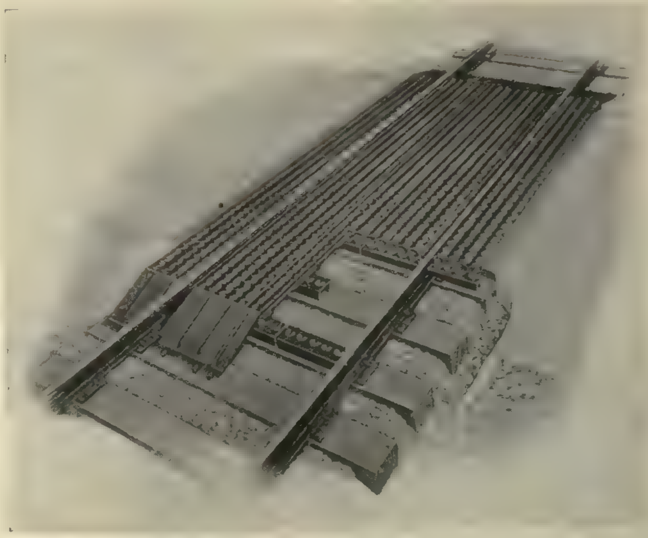
The grating platform is said to be non-slip even in extremely muddy weather or in ice-forming conditions. This non-slip feature is accomplished because of forced drainage of the open flooring and a twisted cross bar construction in the grating itself, affording many points of friction contact in walking. The bars are spaced so that there is no hazard of heels becoming caught between them. The city of Detroit was the first municipality to install these zones, having done so after much experimental work and trial.

∾

Pressed-Steel Crossing

RAIL-HIGHWAY crossing, said to require little or no maintenance, has been placed on the market by the A. O. Smith Company, Milwaukee, Wis. The crossing is made up of pressed-steel members, only three different shapes being used. They have been designed to obtain the maximum distribution of load to enable them to withstand shocks and loads from abnormal traffic and still be light in weight. A crew of two men can easily and quickly assemble or disassemble the crossing without the need of a crane or hoist.

The roadbed requires no other preparation than the use of sawed ties spaced 18 in. apart. Locking bases are spiked to these ties, flangeways are slid in along the ball of the rail, and finally the deck channels are laid in place and then moved endwise 9 in. to interlock. Suitable end ramps are furnished if desired. They are made of pressed steel to safeguard against dragging equipment and to act as end-thrust members for the deck channels. Raised nubbins, pressed integrally with the shapes, make the surface of the crossing non-skid even under bad weather conditions.



Non-skid, ease of installation and no maintenance are the chief claims made for this pressed steel crossing

NEWS *of the Industry*

Improvement Projects

El Paso, Tex.—Three of the eight cars being rebuilt at a total cost of $12,000 by the El Paso Electric Railway are now operating on the Mexico line. Among the new features are dash lighting, dome lights for the interior, sanitary hand straps, motorman's mirrors, and interlocking doors. Passengers can leave the car at the front as well as the rear end. The interiors are painted red, white and blue, with gold lettering and striping.

◆

Chicago, Ill.—A new overhead transfer bridge on the Chicago Rapid Transit lines at Jackson Boulevard and Wells Street is to be placed in service this month. The bridge is intended primarily to allow passengers on the inner loop "El" trains to transfer to the Wells Street terminal of the Chicago, Aurora & Elgin line without first going to the street.

◆

Michigan City, Ind. — The Chicago, South Shore & South Bend Railroad has installed three sets of switch heaters designed to keep switches free from ice and snow during stormy weather. One set, being tested at the east end of Tamarack siding west of Michigan City, uses a gas flame to heat the points of the switch; one near Virginia Street, Gary, uses electricity; and one in the yards at Michigan City uses oil burners.

◆

Tremont, Ind.—The Chicago, South Shore & South Bend Railroad is soon to construct a siding here 1,150 ft. long, for unloading material to be used in Dunes State Park.

◆

Kokomo, Ind.—Officials of the Indiana Railroad have announced that the entire 30 to 100 ft. right-of-way of the 20-mile interurban line between Kokomo and Loganport, abandoned last fall, will be deeded without charge to farmers whose property adjoins the right-of-way, the company taking in return easements for transmission lines.

Bus Operations

Kenosha, Wis.—If the Railroad Commission approves plans which were presented to it recently for the establishment of a trolley bus service here to replace the present street car and bus system, Kenosha will be the first city in the country to be served exclusively by the trolley bus.

◆

Syracuse, N. Y.—The Cayuga Omnibus Corporation has received a certificate from the Public Service Commission authorizing the operation of a bus route between Marcellus and Syracuse. This company already operates several routes in Auburn and the Town of Owasco and

(*Late News Continued on Page 336*)

Maintenance Discussed by Middle Atlantic Equipment Men

With a program of papers, formal addresses and questions about evenly divided between the street car and bus interests, the regular semi-annual meeting of the Electric Railway Association of Equipment Men, Middle Atlantic States, was held May 14 and 15 at the Hamilton Hotel, Washington, D. C.

President D. E. Frame introduced C. M. Sharpe, assistant to president of the Washington Railway & Electric Company, who described railway and bus operation in the federal district.

Dean Locke, director of research United Railways & Electric Company of Baltimore, made an informal progress report on the operation of the 150 new cars put into service on that property during the past year. These cars are designed for fast acceleration and deceleration as well as passenger comfort. They are now operating on ten out of the company's 30 lines, furnishing about 25 per cent of the system car mileage. According to Mr. Locke, they have increased the speed of the ride 14 per cent, and have met with a favorable reception at the hands of the public.

W. C. Klein, superintendent of equipment of the Lehigh Valley Transit Company, in his paper, "Some Aspects of Free Wheeling," described a number of interesting developments carried out under his direction on one of his company's cars. This car, which has been in operation on one of the city lines since Jan. 2, 1931, is mounted on a modified Brill truck with split axle drive, propelled by eight 35-hp. motors. Unusual performance in the way of smoother operation, less power consumption, and easier riding qualities is claimed for the car by Mr. Klein.

At the afternoon session the delegates were addressed by J. H. Hanna, president the American Electric Railway Association, who reaffirmed his faith in the future of community transportation. "In spite of the difficulties through which we are now passing," said Mr. Hanna, "I believe this business is a permanent business—much more sure of its future than many other of our present-day organizations." He added that he hoped for a changed attitude on the part of the public toward the electric railways.

"The M-33 Brake Valve as a Means to Improved Braking," was the subject of a paper by J. F. Craig, of the Westinghouse Traction Brake Company. Mr. Craig dwelt particularly upon the results obtained in Baltimore, where this type of brake had been installed on 250 cars. Bus maintenance practice as developed under his

(*Continued on Page 331*)

Coming Meetings

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

July 16-18 — Mid-West Electric Railway Association, Brown Palace Hotel, Denver, Col.

July 29-31—Electric Railway Association of Equipment Men, Southern Properties, Richmond, Va.

Aug. 6-8 — Pacific Claim Agents Association, Stockton, Cal.

Sept. 9-10—Central Electric Railway Master Mechanics' Association, Cincinnati, Ohio.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29 — Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Permanent Transport Exhibit

New York's first permanent exhibition of the development of land and sea transportation from their beginnings to the present day, comprising hundreds of exact scale models of ships, trains, wagons, automobiles and other conveyances, together with numerous historic originals and replicas, was opened to the public on May 25 at the Museum of Science and Industry, 220 East 42nd Street, by Frederic B. Pratt, president of the museum, in the presence of a large group of prominent New York industrialists, railroad and ship executives. The exhibit covers highway, railroad and marine travel respectively.

Co-ordination in Philadelphia Approved—Cab Fares Cut

The Board of directors of the Philadelphia Rapid Transit Company, which was reorganized under the direction of Judge Harry S. McDevitt recently following the capitulation of the Mitten interests, voted on May 26 to retain the system co-ordinating trolley, bus, subway, elevated and taxicab service, but decided to reduce taxicab fare by 5 cents a mile, effective July 1.

There was nothing in the formal statement issued after the meeting to indicate what would be done with the Quaker City Cab Company, which had been bought for $1,360,000. Judge McDevitt denounced this deal some time ago and recommended that it be repudiated. The transit company also owns the Yellow Cab Company, but this will be retained.

One of the notable decisions reached by the board was to retain Dr. A. A. Mitten "to give his entire time to the service of the company" as chairman of the board, "to develop plans and policies for the board, to direct the operation of the co-operative plan and to perform such other duties as may be assigned to him by the board."

The *Ledger* said that Dr. Mitten, as the new deal worked out, found himself a "chairman of the board" without portfolio, but that "under the new plan it is anticipated that he will receive a salary."

Bus Operations

(*Continued from Page* 325)

also a route betwen Auburn and Syracuse which passes through Skaneateles and Marcellus. The receivers of the New York State Railways oppose the taking on of passengers within the city limits of Syracuse for discharge within the city. The consent of the city restricts such transportation except between Hutchinson Avenue and the city line.

◆

Memphis, Tenn.—The task of studying the many problems involved in the conversion of certain lines of the Memphis Street Railway into trolley bus routes is well under way by experts of the railway and the public utilities and engineering departments of the city. It is expected that the work will be far enough advanced by June 15 to enable a date to be set for installation of the first route.

◆

Evansville, Ind.—The petition of the Evansville, Suburban & Newburgh Railway, operating buses from Evansville to Newburgh and Boonville, to run buses from Boonville through Spurgeon, Winslow, Petersburg and Washington has been denied by the Public Service Commission. This company replaced rail service on the Evansville-Boonville line and the Evansville-Newburgh line less than a year ago with service by bus.

Service Changes

South Bend, Ind. — A program for equipping six more of the railroad's passenger cars with new style, individual, "bucket type" seats, has been announced by the Chicago, South Shore & South Bend Railroad. Forty-four of the line's passenger cars are now equipped with these latest type seats. Changing the seats necessitates extensive alterations inside the cars.

◆

Los Angeles, Cal. — Plans to curtail service on the Pacific Electric motor coach line serving Hollywoodland, Hollywood, Beverly Hills, the University of California at Los Angeles, Santa Monica and Ocean Park were considered at a conference attended by representatives of the carrier, of the districts affected and the State Railroad Commission. It is expected that present schedules will be maintained from 6:30 a.m. to 9 a.m., and 3 p.m. to 7 p.m., with hourly service for the rest of the day.

◆

Salt Lake City, Utah—The Salt Lake & Utah Railroad has asked the Public Utilities Commission for permission to reduce the number of trains it operates daily over its lines, and to substitute, for at least a part of the abandoned service, a bus line between Salt Lake City and Payson. In lieu of the present schedule of eight passenger trains daily each way between Salt Lake City and Payson, it is proposed to operate six trains daily between Salt Lake City and Payson, with an additional train, from Provo to Salt Lake City and a bus each way daily between Salt Lake City and Payson. The petition denies any intention of handling local traffic between Salt Lake City and Sandy, in opposition to the Utah Light & Traction Company service. On the Magna route, seven train or bus trips each way are on the proposed daily schedule.

◆

Waverly, N. Y.—The Waverly, Sayre & Athens Traction Company, which substituted bus for trolley service between Waverly, N. Y., and Sayre and Athens, Pa., about a year ago, has been asked to begin removal of its tracks and overhead equipment here before June 1 in accordance with its agreement with the city.

◆

Los Angeles, Cal. — Patrons of the Pacific Electric Railway between downtown Los Angeles and Hollywood prefer the longer surface line by way of Hill and Sunset to the route by subway through the hill. This is believed to be due to the greater accessibility of the surface line.

◆

Davenport, Iowa — A fleet of six modern street cars, designed with particular attention to the requirements of the bridge line between Davenport and Rock Island, will be put into service by the Tri-City Railway to replace cars of a type now considered obsolete.

◆

Los Angeles, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for authority to abandon passenger service between Arlington and Corona.

Convention Entertainment

PRELIMINARY plans made by the Entertainment Committee for the 50th Annual A.E.R.A. Convention include a variety of events beginning on Sunday, Sept. 27, and continuing through Thursday. Those now scheduled are:

SUNDAY

Golf Tournament, Atlantic City Country Club, Northfield, N. J.

MONDAY

Afternoon—Ladies Tea, Auditorium. Informal Bridge, Auditorium.

Evening — President's Reception, Auditorium.

TUESDAY

Afternoon — Ladies Musicale and Tea, Auditorium. Informal Bridge, Auditorium.

Evening—Advisory Council Night, Auditorium.

WEDNESDAY

Afternoon—Ladies Bridge Tournament with Music, Auditorium. Tea, Auditorium.

Evening — Special Entertainment, Auditorium.

THURSDAY

Afternoon—Ladies Tea, Auditorium. Informal Bridge, Auditorium.

Evening — Formal Dance, Auditorium.

San Francisco, Cal. — The Market Street Railway cars began running regularly over the Municipal rails on Market Street on May 11, to permit the Market Street Railway to reconstruct its track on Market Street between Jones and Gough Streets. The Market Street cars will use their own rails during the rush hours, from 3 to 7 p.m.

◆

St. Louis, Mo.—The St. Charles Electrical Express Company, which for many years has maintained an express service between St. Louis and St. Charles, Mo., using the tracks of the St. Charles Electric Railway of the St. Louis Public Service Company, will, hereafter, carry its express in trucks to improve service. In the past one round-trip a day was made. Two trips each way will be made by truck.

◆

Sault Ste. Marie, Mich.—What is believed to be the oldest system of the kind in Michigan will be discontinued within six weeks if the Sault Ste. Marie Traction Company carries out its announced intention to suspend. President Frederick expects that the city or some private corporation will install buses.

Financial News

Minneapolis, Minn. — Vice-President McGill, of the Twin City Rapid Transit Company, says bus line feeders are an economy for crosstown lines and extensions, but that it would be impossible to supplant trunk line trolleys by bus and give economical and satisfactory service. The Nicollet-Hennepin bus line handles 8,000 passengers a day while on either side one block distant is a car line, one of which carries 125,000 passengers daily and the other 115,000. Operating costs of the street cars are 30 cents a mile and of the bus 25 cents a mile, but in the cars many more persons are accommodated for only 5 cents a mile additional expense.

◆

Omaha, Neb.—At the request of the City Council, Acting Mayor John Hopkins has announced a committee of nine citizens to assist the Council in discussing the requests of the Omaha & Council Bluffs Street Railway to be relieved of the cost of paving between the rails and of occupation tax so as to avoid the possibility of an increase in fares.

◆

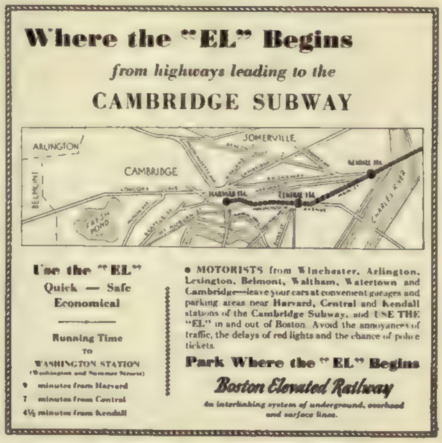
Ogden, Utah—At the annual meeting of the Utah-Idaho Central Railroad, E. G. Bennett was elected a director to succeed Marriner A. Browning, resigned.

◆

Canton, Ohio — Offering to continue railway service between Canton and Massillon, the Intercity Rapid Transit Company, Inc., formed by Canton and Alliance men, has asked the City Council for permission to operate electric cars between the western city limits and the Canton city square. Options have been secured from the Canton Traction Company, owner of the Canton-Massillon line, on the trackage to serve the two cities, sufficient rolling stock to provide railway service and the car shops at Massillon. The Public Service Commission will hear on May 13 the plea of the

(*Continued on Page* 328)

Convenience of Boston "El" Told in New Advertising Series


ARLINGTON
SOMERVILLE
CAMBRIDGE
BELMONT
FRESH POND
HARVARD STA.
CENTRAL STA.
KENDALL STA.
CHARLES RIVER

Where the "EL" Begins

from highways leading to the

CAMBRIDGE SUBWAY

Use the "EL"
Quick — Safe
Economical

Running Time
to
WASHINGTON STATION
(Washington and Summer Streets)
9 minutes from Harvard
7 minutes from Central
4½ minutes from Kendall

● MOTORISTS from Winchester, Arlington, Lexington, Belmont, Waltham, Watertown and Cambridge—leave your cars at convenient garages and parking areas near Harvard, Central and Kendall stations of the Cambridge Subway, and USE THE "EL" in and out of Boston. Avoid the annoyances of traffic, the delays of red lights and the chance of police tickets.

Park Where the "EL" Begins

Boston Elevated Railway

An interlinking system of underground, overhead and surface lines.

Enticing those who would roll their own

Once again the Boston Elevated Railway is using newspaper advertising to maintain and, if possible, increase rider volume during the summer months. Last year a campaign was run in Boston newspapers featuring the advantages of using the rapid transit lines from the suburbs into the city proper. The whole campaign was built around the thought of "Park where the 'El' begins." This year the company answers that question which inadvertently arises: Where does the "El" begin? The heading of every ad in this year's campaign reads: "Where the 'El' Begins—From Highways Leading to the East Boston Tunnel." This head remains the same in all the ads with one exception, and that is the very last words, which are changed to Cambridge Subway, Forest Hills, or whatever the section may be.

A map of the section of the line serving the suburbs in the various sections is shown in each ad. Included in the ads is information about the running time from that particular station to various intown stations.

The whole theory of the advertising is one of co-operation with the motorist. Last year's campaign played up the dangers met in the traffic problems of intown Boston. In Boston they are particularly bad. This year speedy transportation is the keynote.

Most of Boston's workers live out in the suburbs—in many cases, distant suburbs. Her narrow streets make traffic movement slow and difficult. Many of the suburbanites own automobiles and use them in going to and from business. To the Elevated, this meant an opportunity to increase its business.

Near every station on the Boston "El's" rapid transit line is a garage or a parking space. The company has even purchased land adjacent to its stations and leased it for parking areas or the building of garages. Thus, the suburbanite can now park his car for a small charge and ride quickly and safely to his place of business.

Five separate ads are included in this year's campaign. They will appear in Boston and suburban newspapers. The ads can be repeated during the summer months since there is no time element in the copy. The insertions are so arranged that one ad appears every day, sometimes twice a day in at least one newspaper.

◆

Terre Haute's Sale Set for June 23

Sale at public auction of all remaining properties of the Terre Haute, Indianapolis & Eastern Traction Company was ordered on May 21 by Judge J. Ryan of Marion Superior Court. The sale will be held in Indianapolis on June 23. The minimum sale price was fixed by the court at $2,500,000.

◆

Fare Cut on Baltimore "Owls"

Transfers will be free between all-night cars in Baltimore after May 16, officials of the United Railways & Electric Company, Baltimore, Md., recently announced. Ever since all-night car service was started 30 years ago, passengers who transferred have had to pay two fares, it was pointed out.

The decision to abandon the 30-year-old practice is an outgrowth of the 10-cent fare and taxicab competition. Officials explained that all-night car service never has been profitable, and that it has refrained from installing the free-transfer privilege for fear of further reducing the revenue from the owl cars. Now, however, with service on a 10-cent basis, the possible losses in revenue from free all-night transfers do not seem to outweigh the advantages of this step to make the service more attractive. It is also believed that the new move is not unlikely to be helpful in "meeting fly-by-night taxi competition with cheaper fly-by-night street car service."

The United keeps fourteen of its 35 lines running all night, the fourteen being selected as the best for connecting the most thickly populated suburban sections with the centers of downtown night life.

◆

Simplification Sought in Indiana Merger

Merger of the Indiana Electric Corporation into the Public Service Company of Indiana, formerly the Interstate Public Service Company, is proposed in a petition filed with the Public Service Commission.

The Indiana Electric Corporation serves with gas and electricity about 30 communities in central-western Indiana which lie between territories served by the Public Service Company of Indiana. The Public Service Company supplies approximately 200 communities with electric service and 25 with gas service and operates an electric interurban railway and motor coach service between Indianapolis and Louisville, Ky. Both companies are in the group of utilities controlled by Midland United.

According to the petition, the joining of the properties will increase the financial stability and will tend to insure continued improvement in the service rendered to the communities through the medium of these properties.

Common stock without par value of the Public Service Company of Indiana would be issued in exchange for all of the preferred and common stocks of the Indiana Electric Corporation.

Trestle for Tracks of Indiana Harbor Railroad at Bellwood Electric Line Crossing

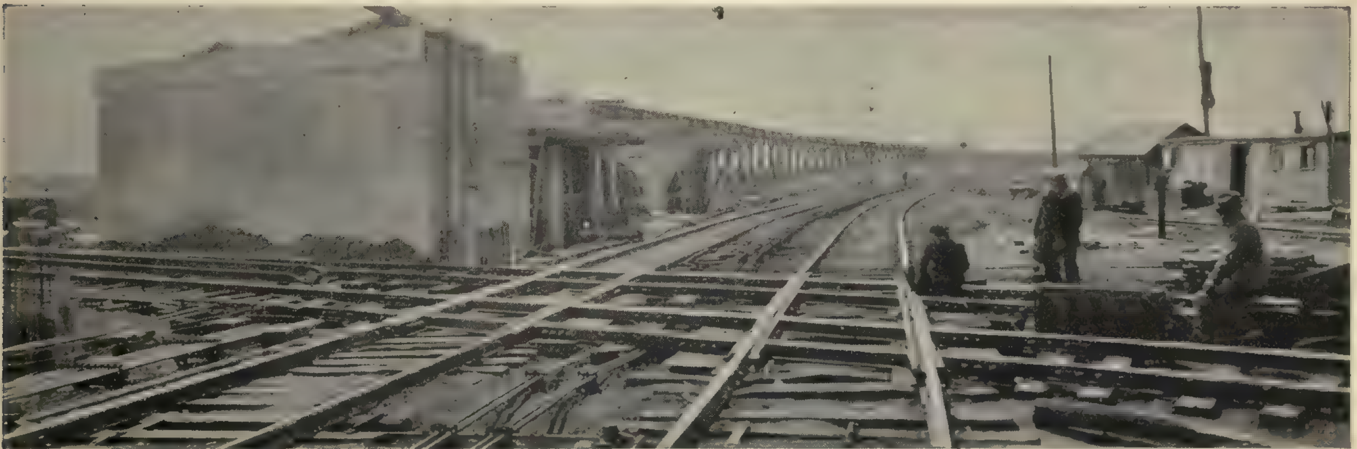


Photo by courtesy of Chicago Rapid Transit Co.

Rapid progress is certainly being made at Bellwood, west of Chicago, on the grade separation project which will carry the tracks of the Indiana Harbor Belt Line over the tracks of the Chicago, Aurora & Elgin Railroad, the Rapid Transit Lines and the Chicago Great Western Railroad. The separation will permit faster service over the Rapid Transit Lines and the Aurora & Elgin Line between the Loop, in downtown Chicago, and the Western suburbs.

Financial News

(*Continued from Page* 326)

Canton Traction Company to discontinue service on the Canton-Massillon interurban. In the event councils of Canton and Massillon grant the new company permission to operate, the commission will be asked to dismiss the hearing on the ground that service will not be continued. C. M. Shetler is president and C. E. Sperow is general manager of the Stark Electric Railroad, which operates between Canton, Alliance and Salem.

◆

Buffalo, N. Y.—Approval of the declaration of abandonment by the International Railway of its Bellevue and Lancaster division, operated in the towns of Cheektowaga and Lancaster and the villages of Depew and Lancaster, was given by the Public Service Commission on May 20, since this portion of the route is no longer necessary for the successful operation of the railway or for convenience of the public. The route to be discontinued includes 53,737 ft. of line.

◆

Harrisburg, Pa.—The mystery of who cashed the checks for $736,000 in the Yellow Cab deal and what become of the cash, which has baffled the State Legislature for so long in its investigation into the affairs of the Philadelphia Rapid Transit Company, was cleared up on May 14 when Albert M. Greenfield, real estate operator of Philadelphia, testified that a member of his office force cashed the checks and gave the money to him. The money was then turned over to the late Thomas E. Mitten.

◆

Albany, N. Y.—The Public Service Commission ordered all utility companies in the state to appear at public hearings before the commission in New York City on May 18, Buffalo on May 20, and Albany on May 25 and file a statement setting forth the amount of securities issued under authority of the commission and the amount of securities which have been authorized but not issued, and to show cause why unexercised authority should not be rescinded.

◆

Indianapolis, Ind.—Reductions in assessed valuations of several more Indiana electric railways have been announced by the state board of tax commissioners. Valuation of the Indianapolis & Southeastern Railroad was cut from $437,770 to $377,605, interurban properties of the Southern Indiana Gas & Electric Company, Evansville, from $180,500 to $129,810; Evansville city lines of the same company from $1,913,410 to $1,238,620; Lafayette Street Railway from $137,510 to $127,020; Dayton & Western Traction Company (in Indiana) from $19,436 to $9,820; and Vincennes Electric Railway from $40,580 to $32,810.

◆

Detroit, Mich.—The City Council has authorized negotiations on behalf of the Municipal Railway for the purchase of as much equipment and other property from the Detroit Motor Bus Company as it deems necessary to establish full municipal control of all bus lines in the city.

St. Louis, Mo. — Oliver Chapman, license collector, reports that for the fiscal year ended on April 10, last, the St. Louis Public Service Company paid the city $194,870 in mill taxes compared with $223,714 the previous year. There was also a falling off in the revenue from the 3 per cent bus tax levied on receipts of the People's Motor Bus Company. During the 1930-31 fiscal year that company paid $73,129 against $76,517 in 1929-30.

◆

Fresno, Cal. — The Fresno Traction Company has lodged a complaint with the State Railroad Commission objecting to rates for electric power charged by the San Joaquin Light & Power Corporation. The commission is asked to fix interim rates pending a hearing.

◆

New York, N. Y.—The Hudson & Manhattan Railroad has obtained a modification of its agreement for power supply from the New York Edison Company, and as a result, it is possible that the company will be able to effect a small reduction in cost.

Regulation and Legal

Portland, Ore. — The public utilities commissioner has notified the six major electric operators in Oregon that he desires statements from them showing the amount of money expended for advertising purposes, the character of the advertising, and where the advertising was placed, and a clear outline of the reasons and necessity for such advertising. Railway companies have been asked to supply similar data.

◆

Los Angeles, Cal.—An amendment to the city charter empowering the City Council to grant franchises for bus lines has been proposed in a resolution of the Council. The resolution was referred to the city attorney and to the Council's legislative committee for study. No mention of bus lines is made in the city charter, according to the resolution, and their increasing use makes it necessary that some provision concerning them be included in the charter.

◆

Los Angeles, Cal.—Demands for extensions in various parts of the city of the Los Angeles Railway's lines are piling up in the Department of Public Utilities and Transportation. As a result its transportation committee is kept busy trying to reconcile the needs of the various communities on one hand and what the company is willing to do, on the other. In response to the request of the board itself that the railway apply for a franchise for a Third Street car line west from Main Street, because of opening and widening proceedings west of the Third Street tunnel, the company has replied regretting that it considers it inadvisable at this time.

◆

Los Angeles, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for exemption from the provisions of an order of the Railroad Commission requiring advance notice to the public of changes in the arrival and departure of certain of its motor coach lines, including those operated by Los Angeles Motor Coach Company.

Harrisburg, Pa.—The Legislature adjourned on May 27 without the Governor sending to the Senate for confirmation a nominee to the Public Service Commission to fill the vacancy caused by the resignation of James S. Benn. A recess appointment is expected. Governor Pinchot, declaring that the Public Service Commission was the "cat's paw of corporations," led the fight for the abolition of the commission and the creation in its place of a fair rate board to be elected by the people. The House lined up with the Governor, while the Senate opposed his program. The session was marked by a continuous fight over public utility regulation, with the result that no outstanding legislation of the kind was passed.

◆

Tallahassee, Fla.—Regulation of street railways, bus companies and all other carriers of passengers or freight between points within the Jacksonville city limits would be under the direction of the Jacksonville City Council under the provisions of a measure introduced in the House. Under the proposal the Council would have authority to regulate fares, the kind and manner of equipment used, including the designation of routing and rerouting of cars, buses or trucks; the increasing and decreasing of service, the fixing of schedules, the location of stops and the laying and removal of tracks.

◆

Madison, Wis. — Payments by customers of public utilities for extensions of equipment required to furnish service may not properly be included in a valuation upon which securities may be issued or upon which rates may be based, it was held by the Wisconsin Supreme Court in a decision just rendered.

General

Indianapolis, Ind. — The Midland United Company has instituted a new series of informative advertisements in behalf of its subsidiary companies. These advertisements are being scheduled in 213 newspapers published in Indiana towns served by these subsidiaries. The ads are essentially informative. Reprints have been made of the first series of advertisements run a few months ago.

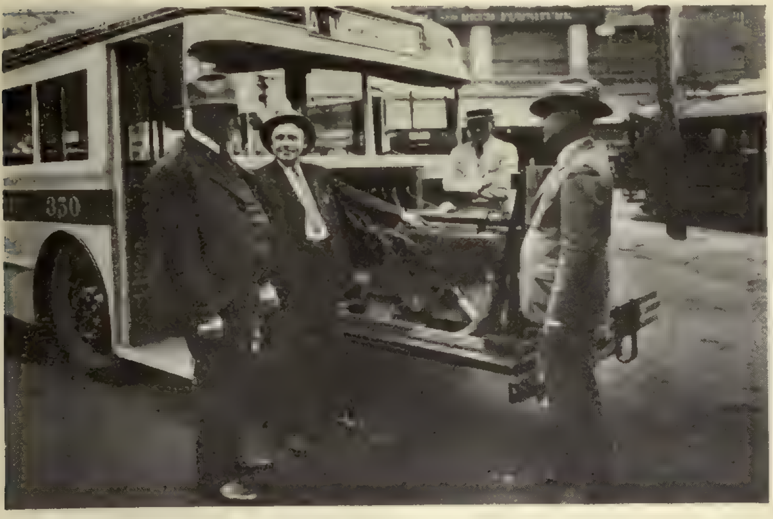
◆

Ann Arbor, Mich. — Announcement has been made of the establishment of a four-year program in transportation engineering by the University of Michigan in recognition of the importance of adequate preparation for one of the most significant developments in modern industrial and social system. This new curriculum will parallel the other established divisions in engineering education and will offer a carefully prepared program leading to the degree of Bachelor of Science in Engineering (Transportation). In subject matter, however, and in the arrangement of courses, it represents what may be considered a departure in engineering education.

◆

Detroit, Mich.—More than 500 of 600 employees at Highland Park car shops of the Department of Street Railways, operating the municipal railway and bus lines, have joined the trainmen's union.

An Engine That Leaves Its Hood



Several novel features are embodied in the construction of 33 new buses recently purchased by the Pacific Electric Railway for service in Pasadena. Twenty-three of the new units, each with a capacity of 28 passengers, are being supplied by the Fageol Company, Oakland, Cal. Ten, of the 24-passenger size, are en route from the plant of the Twin Coach Company, Kent, Ohio. The entire lot represents an expenditure of about $282,000.

The Fageol buses have been designed with a "travel out" engine. The 120-hp. Hall-Scott engine can be projected out in front of the coach within 30 seconds by means of a separate electric motor. This novel feature is intended to aid in speeding emergency repairs without discomfort to passengers.

The entire engine can be removed in two minutes, thus facilitating repairs and saving shop space when a new motor is installed. The engine is projected 60 in. in front of coach, and, after repair is completed, the engine can be started and tested without first being returned to the normal position.

Another Chicago Consolidation Step

Three final decrees, ordering the foreclosure and sale of the Chicago Surface Lines, were entered by Federal Judge Wilkerson on May 11. The action was a legal prerequisite to the consolidation of the Chicago transportation companies.

The company has ten days in which to meet obligations of approximately $80,000,000. Thereafter, a date of sale may be asked by attorneys responsible for the reorganization plan. Thomas J. Pedden was appointed special master to handle the sale. He will receive bids and report back to the court.

The decrees entered were virtually the same as submitted recently by attorneys for the First Union Trust & Savings Bank and the Harris Trust & Savings Bank, trustees for the three classes of securities holders.

◆

Long Period of Public Control

As indicated briefly in Electric Railway Journal News for May 23, Governor Ely of Massachusetts has signed the Boston Elevated Railway bill. Thus, it is hoped, six years of discussion, not to say altercation, have come to an end.

The new law provides for continuance of public control for 28 years, for a reduction of common dividends from 6 per cent, as guaranteed under the 1918 law, to 5 per cent, and for the purchase of the preferred stock from the proceeds of a bond issue to be made by the transit district. Large savings in fixed charges will thus be made.

The act now must be accepted by the stockholders but acceptance is expected and the public in general feels that, while none of the parties gets all it might ask for, the settlement is the best that can be made.

The Legislature passed the 1918 act at at a time when the system was in dire need and made the law a contract between the commonwealth and the elevated company, giving the stockholders a veto power over any plan for continuance of public control that the Legislators might formulate. That act provided also that the state might take over the road on certain terms and also exercise an option for return to the owners under certain conditions.

◆

Governor Signs Interurban Tax Relief Measure

The Washington, Baltimore & Annapolis Electric Railroad, operating under a receivership, has been relieved of the payment of state and county taxes in Maryland for a period of two years since Governor Ritchie has signed a bill to this effect passed by the General Assembly. As originally introduced, the bill provided for exemption for four years, but it was amended to permit the Assembly to act on the subject again at the session two years hence.

The taxes from which the company will be relieved amount to almost $100,000. When the receivership action was taken it was announced that unless substantial economies were brought about the road might discontinue. Schedule changes have been made and the employees have agreed to a substantial reduction in wages. Residents of Anne Arundel County opposed the concession to the company, but representatives of the United States Naval Academy, located at Annapolis, urged passage of the bill.

In signing the measure, Governor Ritchie said it could not be considered a strictly local measure as the road provides service between Washington, the capital of the nation; Baltimore, the largest city in Maryland, and Annapolis, the capital of Maryland and the home of the United States Naval Academy. The effect of abandonment of the road, the Governor said, on the people of Annapolis and Anne Arundel County could hardly be estimated.

General

(*Continued from Page* 328)

Oakland, Cal.—East Bay Street Railway, Ltd., and East Bay Motor Coach Lines, Ltd., applied to the Railroad Commission on May 23 for authority to increase the one-way cash fare on both systems from 7 cents to 10 cents, and to sell seven tokens for 50 cents.

✦

Newark, N. J.—Public Service Coordinated Transport intends to use the present type of trolley cars on the lines of the Newark City Railway, the new rapid transit line, while observing that, with operation not expected to begin until 1934, it is impossible to make plans except as to "broadest policies." The equipment listed as available for operation in City Railway includes 186 cars. They have an average seating capacity of 54 passengers and are rated as able to carry an equal number of standing riders "with reasonable comfort." One hundred trailers, also are listed as available. They seat 65 passengers and are rated as having enough aisle space to carry an equivalent number of persons standing.

✦

San Francisco, Cal.—A survey of the Municipal Railway by engineers of the State Railroad Commission will be recommended to the Board of Supervisors by its Public Utility Committee in the hope that it will show "what is wrong with the Municipal line."

✦

Memphis, Tenn. — The Memphis Street Railway joined in the gala celebration of May 8, during National Music Week, the event being climaxed with a parade of 40 bands from the tri-states led by Memphis Federation. There were about 50 floats by Memphis stores and industries. The railway contributed two units of flat cars beautifully decorated and lighted. More than 700 musicians appeared on the floats and with the bands.

✦

San Francisco, Cal.—The Market Street Railway has erected three painted signboards on company property at different points. Each sign is about 80 ft. long, the top being about 16 ft. from the ground. The cars depicted on the sign are painted in natural color—deep green bodies, white fronts, gold striping. At night the signs are illuminated with nine 200-watt, direct-current lamps hooked to the regular trolley current in series, with latest sign reflectors attached.

✦

Washington, D. C.—During 1930, state gasoline taxes yielded nearly $500,000,000, an increase of 14.6 per cent over the 1929 figures, according to a statement made on May 3 by the Bureau of Public Roads, Department of Agriculture. Every one of the states and the District of Columbia now has a gasoline tax, the report reveals, the rate varying from 2 to 6 cents. The average rate for the country was 3.35 cents.

Lack of Leadership Shown at Business Conferences

The Chamber of Commerce of the United States and the International Chamber of Commerce are the most important and representative organizations of business men in the world. The first expresses the common interests of business in the richest and most powerful industrial, commercial and financial nation; the second, the common interests of business in 35 countries, including nearly every part of the globe except Russia and some of Latin America. Coming as they did, in the middle of the most severe depression in modern history, on two successive weeks, the meetings of these two bodies were a dramatic event.

To evaluate the outcome of these conferences, domestic and international, it is necessary to remember their limitations. These organizations are not agencies for action but forums for exchange of experience and expression of opinion. They are composed of the most diverse interests, not organized on the basis of single industries or lines of trade. The American Chamber is made up of large numbers of small business men as well as representatives of the dominant concerns. To this diversity of domestic interests the International Chamber adds that of national differences. Some of the national chambers are really governmental agencies. In both bodies purely political factors—personal, national or international—inevitably play a part and help to paralyze or shape purely economic considerations. Moreover, the effectiveness of the national chambers is hampered by the fundamental differences between rural agricultural and urban industrial or financial psychology; and the international body by differences of language. They are exclusively employers' organizations.

Despite these handicaps, the potentialities of accomplishment are great. It is possible through these organizations not merely to promote better understanding among the diverse interests through personal contact and exchange of practical experience among business leaders in different fields and different countries, but also to present to the public and to government pronouncements of principle or policy or even general programs of action to be executed by individuals, organized industries or public authorities. Something of this sort was certainly expected at this time. In some of these respects the result was undoubtedly disappointing. The degree of disappointment depends upon the extent of one's expectations.

The discussions, reports, personal contacts and exchange of experience were of practical value, served to concentrate serious attention on current economic problems, helped clarify understanding of the depression, and strengthened the sense of responsibility of business for economic security and social welfare. In all these respects the work of the International Chamber was more substantial and impressive than that of the American Chamber. But neither at Atlantic City nor in Washington was American business leadership at its best.

The psychology of the conferences was one of anxious caution and conservative control, not of creative courage. It was turned backward to the past, not forward to the future. It was concerned primarily with discovering the causes of what has happened—exposing the follies, errors and evils of the past, reconstructing and readjusting things to a previous condition, complaining about the various handicaps to remedies that have been proposed—not with pushing out along new paths, or even carrying on the constructive accomplishments of recent years. These were largely condemned and repudiated. There was no remedy but by restoring the *status quo ante* by thrift, hard work, restricting production, canceling debts, lowering tariffs, reducing wages and living standards and abandoning all "artificial" efforts to prevent deflation and readjustment. Only here and there was there occasional recognition of the need for new forms of governmental or organized business effort to meet new problems or promote further progress, especially in relation to employment stabilization.

INTERNATIONAL BUSINESS RELATIONS DRIFTING

The International Chamber was racked by concealed conflicts of national interests over war debts, tariffs, commercial policies silver, Russian relations. Business men at these meetings persistently protested against the extension of governmental activity in economic matters, but were obviously relying more and more upon governmental support for their special industrial or national interests. They protested against trade barriers, but were at the same time preoccupied with various new protective devices. Business abroad is evidently being driven into concerted action through cartels, regional commercial agreements and other arrangements which are creating new conflicts and subjecting it to new governmental controls for political purposes. In the discussions of Russian and European-American trade relations, in the comments on American tariff policies and in the disputes over the most-favored-nation principle in commercial treaties, it was obvious that new forms of economic nationalism are developing and that international business relations are drifting more and more definitely under governmental control, as a consequence of failure of co-operative business effort.

Although there was the usual insistence on the interdependence of nations, the striking feature of this meeting was the emphasis laid upon inherent differences in economic structure and social psychology among the various countries, especially in Europe and America. For the first time there was an evident tendency to admit that international interdependence is not uniform or universal, that international co-operation has its limits, and that intelligent nationalism has its advantages. This realistic reaction against exaggerated international idealism appears to be an important by-product of the depression along with the recognition by business men of their primary responsibility for the econmic security of the working classes in their own country.

At the Atlantic City meeting two distinct phases of transportation constituted topics of round-table discussion. Wide differences of opinion were in evidence among railroad, highway and waterway adherents at the conference which considered the question: "What Is Fair Competition in Transportation?" Moreover, no appreciable progress was made toward agreement. At the conference to discuss mass transportation, however, harmony of opinion prevailed concerning the importance of this problem to the business men of the country and the need for intensive study of its economic aspects.

As indicated in ELECTRIC RAILWAY JOURNAL News for May 2, representatives of mass transportation agencies emphasized two major points in presenting this subject: the vital necessity of mass transportation to business, industrial and civic development, and the fact that companies rendering this essential service are not able to operate on a sound financial basis, and have not been able to do so for some time. It was held that the relative merits of different kinds of vehicles was a matter of detail to be settled after study of actual conditions in specific places.

The Business Outlook

BUSINESS has reached its resistance level. The full April records clinch the evidence of improvement. Production volume has increased slowly for four successive months, supported especially by lines involving consumer goods rather than capital goods. Business failures have apparently passed their peak. Construction, however, is the conspicuous laggard. Firm Federal Reserve policy has become a plainly favorable influence in interior and foreign money markets. Doubtless all these factors dictated the cautious, oracular optimism of official utterances from the capital at the recent cabinet meeting.

—*The Business Week.*

Exclusive Use of Street by Railway Suggested

A petition signed by the owners of property fronting on Chestnut Street between Fourth Street and Twelfth Boulevard, St. Louis, Mo., has been presented to the St. Louis Public Service Company requesting that a one-way street car track be laid in Chestnut Street to relieve traffic on Olive Street. The company is asked to divert either its eastbound or westbound track on Olive Street east of Twelfth Boulevard to Chestnut Street. The signers of the petition said that if the company will consider operating cars on Chestnut Street they will ask the Aldermen to make Chestnut Street a railway street exclusively. It is estimated that the plan would save car riders 20,000 hours a day.

Buses to Replace Omaha Interurban

The Omaha & Southern Railway, an interurban owned by the Omaha & Council Bluffs Street Railway, has been authorized by the Nebraska Railway Commission to abandon its service and remove its tracks. The commission said that if rates to which it were entitled by law were fixed, they would be prohibitive. Moreover, the commission refused to adopt the theory of objecting patrons who desired the road continued because it is an integral part of the city system, the state body ruling that it cannot burden Omaha patrons with a deficit sustained by separate suburban lines. The Omaha & Suburban Bus Company has been organized in the interest of the railway to supply bus service over that part of the rail route calculated to prove remunerative. The interurban runs from Omaha through Bellevue to Fort Crook.

Buses Brought Under New York Commission

Governor Roosevelt of New York on April 21 signed the Thayer bill as Chapter 531, laws of 1931, amending the public service law in relation to state regulation of bus lines. This measure for the first time brings bus companies under the jurisdiction of the Public Service Commission in New York. The Governor felt that New York State has been far behind in the line of progress in placing this class of corporations under the jurisdiction of its regulatory utility body. Protest was made to him relative to the penalty provided in the bill for violation of its provisions, but he obtained an opinion from the Attorney General pointing out that this bill did not change the penalty in this regard from what it was before. The Attorney General said:

> Under existing law the operation of a bus through the streets without a certificate of convenience and necessity is a misdemeanor (Sec. 29, Penal Law). The owner and the driver may be arrested. The proposed law simply states this in more direct and emphatic terms in the confines of the statute itself without necessity of going to the Penal Law to find the violation denominated the same crime.
>
> It is my opinion that present statutes make the act as much a misdemeanor as does the proposed law. Nothing will be new in this regard.
>
> Under presently existing law, no omnibus line can operate in a city without (1) having obtained the consent of the city and (2) a certificate of convenience and necessity (Sec. 65, 66, Transportation Corporations Law; Long Beach vs. Public Service Commission, 249 N. Y. 480). In towns and villages, if such municipalities pass a resolution requiring their consent, the omnibus line must likewise first obtain that consent and then a certificate of convenience and necessity (Sec. 67, Transportation Corporations Law), except that under the proposed law the municipalities may not unreasonably withhold their consent.

Maintenance Discussed

(*Continued from Page* 325)

Gorum, assistant master mechanic of the Virginia Electric & Power Company. Mr. McGorum believes that mileage is the most effective basis on which to carry on maintenance, but that its adoption as a standard should be accompanied by a diagnosis by each operator of the peculiarities of his own equipment.

A description by R. C. Hall, engineering aide of the United Railways & Electric Company of Baltimore, of the twelve double-deck buses recently put in service in that city completed the first day's session. Mr. Hall outlined the considerations which led to the selection of this particular size and type of equipment.

The second morning was taken up with discussion of a prepared list of questions. York, Pa., was chosen as the next meeting place. Officers chosen to direct the affairs of the association during the ensuing year follow: President, J. T. Porter, superintendent of equipment Virginia Electric & Power Company; vice-president, C. E. Keefer, master mechanic Altoona & Logan Valley Electric Railway; secretary, R. D. Voshall, superintendent of equipment Washington Railway & Electric Company.

The entertainment program included a banquet on the evening of May 14. Following the closing session a visit by bus was made to the new garage of the Washington Railway & Electric Company and the shops of the Capital Traction Company.

Elimination of Steam Contemplated in England

Complete electrification of all British railroads over a period of twenty years at an estimated cost of approximately $1,860,000,000 is favored by the special committee, headed by Lord Weir, in its report to the British Government.

Describing the project as one of unusual magnitude in the history of world enterprise, the committee recommends the substitution of electricity for steam over the entire British railway system. If adopted, the scheme, according to the committee's calculations would cost the railways approximately $1,270,000,000, the Central Electricity Board $390,000,000 and $200,000,000 for suburban electrification.

The committee's report states that the total mileage of standard gage lines not already equipped for electric working is approximately 36,000 track-miles running line and 15,500 miles of sidings. The estimates of cost call for 10,400 electric locomotives and 4,800 equipments for three and four coach multiple unit sets, and includes equipment for carriage heating.

The committee takes the view that the electrification of the railways should not be allowed to proceed by piecemeal stages, but that the transformation from steam to electricity should be achieved by a single comprehensive scheme.

Commenting on the capital expenditure involved, the committee states:

> The magnitude of this would be unique in the history of world enterprise. On the other hand, we feel bound to point out that without any predetermined long-term program, our national expenditure on the construction, improvement, and maintenance of roads in the last ten years has probably amounted to the colossal sum of £500,000,000 and is now proceeding at the rate of over £60,000,000 per annum.

The three members of the committee, which was appointed in September, 1929, are Lord Weir, Sir Ralph Wedgewood, chief general manager of the London & Northeastern Railway, and Sir William McLintock, an eminent accountant. Their report is unanimous, and it is generally understood in British circles that the railway companies are in agreement with the committee's findings.

Leeds Tram Cars Continue Popular

Continued popularity of the tram car as a means of transportation in England is attested to by the annual report of the general manager of the Leeds, England, Tramways and Transport Department. The total receipts for the year, amounting to £1,045,275, constitute a record for total income in the history of the undertaking. Receipts from the tramway alone were £939,002, an increase of 2.03 per cent over the previous year, while motor buses yielded receipts amounting to £106,273, an increase of 24.45 per cent.

As an indirect advantage of the tramway to the city, the report states that of the total revenues no less than £525,000 are paid in wages to the employees, who are practically all Leeds citizens. This represents more than 50 per cent of the receipts. In addition, large purchases of manufactured goods and raw materials are made locally.

Electricity for the tramway is supplied by the municipal electricity department, for which the sum of £41,192 was paid. This made the tramway one of the largest and most profitable customers of the lighting department. Costs for pavings and maintenance of pavings of the tramways were heavy. Assumption of these costs by the tram relieved the highways department, but resulted in little benefit to the car riders. In addition, £42,041 were paid in local taxes during the year.

Despite the large earnings, the average fare charged is approximately ½ penny (1 cent) per mile.

Important Subway Extension for London

The decision of the London Underground to extend the Bakerloo section of the London Electric Railway from the Elephant and Castle, its present eastern terminal, has been publicly acclaimed. The extension will be 1.75 miles long. It will be served by two new stations. The cost of the new work will be approximately $9,375,000. If the necessary powers are obtained the line will open in 1933.

◆

London, England—The County Council has decided to make another trial of two-pence all-the-way fares on its cars on Sundays, the concession to extend from the third Sunday in April till the last Sunday in September. Last year the experiment was made during August, September, and October. The two-pence all-the-way fare obtains all the year round on week days during off-peak hours. The one-penny fare, of course, continues for short distances.

◆

Tokyo, Japan—"In the future," says the *Japan Advertiser*, published in Tokyo, "the motorist who races trains to crossings will do so at his own risk. His heirs will have no claim on any railway, public or private, if his temerity sends him on a journey he had not expected to take so immediately. The new ruling is a recognition of the fact that this is an age of speed, and that the country will be benefited more by faster train schedules than by preserving the lives of idiots who race trains to crossings."

◆

Nottingham, England—The Council has approved a scheme for the conversion of its tramways and its petrol bus services to the trolley bus system at an estimated cost of £203,925. This includes £156,400 for trolley vehicles and £45,525 for overhead equipment. The routes will radiate from the center of the city, with a circular route like the rim of the wheel connecting the radial routes. An outer ring along a new road is also contemplated. The Town Council has powers for the expenditure of £900,000 in all for conversion to the trolley bus system, and for extensions. It was stated at the meeting of the Council at which the step was approved that it has been the experience of the Transport Committee that whenever local lines had been converted to the trolley bus system earnings per mile run went up perceptibly. In the last annual report the respective revenues per mile run were shown as follows: Buses, 11.15d.; tramcars, 16.49d.; trolley buses, 17.84d. The respective surpluses per mile were: Buses, 0.97d.; tramcars, 3.48d.; trolley buses, 5.93d.

Plymouth, England—The Council has approved a proposal to eliminate the tramways and to substitute buses gradually over a period of ten years. If full tramway service were maintained, £25,000 would be required for track reconstruction and £62,000 for new tramcars. The track length of the Plymouth tramway is about 34 miles.

◆

London Underground Agrees to Traffic Board Scheme

Lord Ashfield, chairman of the London Underground combine, recently presided over a meeting in London of the stock and shareholders of the twelve undertakings associated in the combine, at which, by a large majority, approval was given to the provisional arrangement reached with the Minister of Transport for placing London traffic under the control of a Passenger Traffic Board. The terms include the right to withdraw from the settlement in the event of any material alteration to the bill by Parliament repugnant to the provisions.

Lord Ashfield said he had been engaged in negotiations with the Transport Minister, in order to obtain such terms for the exchange of stocks as he could recommend for acceptance. He said:

> We are still engaged in negotiations with the Minister upon the amendments required in the bill, and even if these should be agreed with the Minister, as I anticipate, we shall be compelled to watch narrowly other amendments which may be introduced into the bill, in case their effect should be to jeopardize or impair your interests.
>
> We have a long and anxious period ahead before all these questions are determined, but to-day we are to decide the course we are to pursue, whether we shall support the bill or oppose it. I hope you will pass a resolution approving what I have already done, and authorizing me to continue my negotiations with the Minister and bring them to a conclusion.

Lord Ashfield then explained the stocks to be issued by the board, and the manner in which the income of the board was to be applied under the present plans. The upshot of the arrangement is that the Underground stockholder after two years shall receive not less than he does today, with an expectation of a further 1 per cent. He continued:

> I can but think that our prospects are improved by the proposals of the bill, and that if in the future we might not obtain quite such large returns as we have a chance of obtaining under the present management, yet the interest will be more surely secured, and will be most certain to continue. I have therefore no hesitation in recommending to you the acceptance of the terms of the memorandum as being in your best interest, and as affording you as good prospects in the future as you might fairly expect.

Lord Ashfield assured the meeting that the Transport Board would be free from political interference. To cries of "No!" he retorted:

> I have read this bill carefully, and I beg you to accept that I know what I am talking about. You cannot conceive I would be guilty of such folly as to suggest to you in a matter in which my whole life has been wrapped, that you should transfer your interests to a board subject to political interference, that could play ducks and drakes with your investments. Acts of Parliament are not treated like scraps of paper. They are scrupulously observed by all parties. I have promised the Minister my support. You may fail to support me, but in that event you will have to find somebody else to manage your undertakings. I have pledged my word, and I am not going back on it.

This speech was greeted with cheers, after which the resolution was carried by a large majority.

The bill is still a matter of debate as to principles.

◆

BOOK REVIEWS

Treatise Both Theoretical and Practical

"Mercury Arc Power Rectifiers," by Othmar K. Marti, chief engineer American Brown Boveri Company, Inc., and Harold Winograd, rectifier engineer American Brown Boveri Company, Inc. Published by McGraw-Hill Book Company, Inc., 473 pages, 230 illustrations, price $6.

Appearing as it does at a time when the application of the mercury arc rectifier to railway power transmission and distribution is becoming increasingly important, this book should be of great value both as a theoretical and practical treatise to power engineers and to executives who come in contact with this newer means of power rectification. Nothing is lacking to make the explanation of the operation of the rectifier complete. For the theory of the operation, all mathematical relations of current, voltage and power factor in the rectifier circuits are derived. Circuit relations of rectifier transformers, the practical design of transformers and the load characteristics of load rectifiers as affected by the type of transformers used are dealt with in some detail. Detailed calculations are also given for several of the more important types of transformer connections.

A part of the book is given over to the outline of present day practice in the application of steel inclosed rectifiers, with emphasis on their employment in railway service.

Materials Standards Indexed

Index to A.S.T.M. Standards and Tentative Standards. Issued by the American Society for Testing Materials, Philadelphia, Pa.

This pamphlet of some 100 pages constitutes a combined index to all A.S.T.M. standards and tentative standards in effect as of September, 1930. A complete list of the 427 standards and 155 tentative standards is given. It is designed to be of service to those familiar with the society's standards in locating any specification or method of test in the bound publications in which it appears and also for the purpose of ascertaining whether standards have been issued on any specific subject.

Economics of Power Plant and Line Design

"Generating Stations, Economic Elements of Electrical Design," by Alfred H. Lovell, professor of electric power engineering University of Michigan. Published by McGraw-Hill Book Company, Inc., 359 pages, 171 illustrations, price $4.

Power generation and transmission having arrived at a highly developed stage technically, the great need now is for further economic studies and developments in this field. Having been developed from lectures and problems given in a course on power plant and transmission systems, this book gives an opportunity to apply the element of economics to the problem of power plant and transmission design in the selection of apparatus, in proportioning the details in an assembled whole, and in balancing initial and subsequent costs. Attention is given to the vital interrelation of the mechanical and electrical elements in the design with detailed analyses of special engineering features. The book contains ten chapters which are devoted to the following: Principles of corporate finance, cost of stations, depreciation and obsolescence, power plant load curves, economical study of distribution systems, power plant location, bus systems, oil circuit breakers, protective relays, and transmission lines with synchronous condensers.

Nemesis and Narcissus

"Business Adrift," by Wallace Brett Donham, with an introduction by Alfred North Whitehead. Published by Whittlesey House, McGraw-Hill Book Company, Inc., New York; 165 pages. Price, $2.50.

Business men cast adrift recently from the sea of profits to engulfing waters of deficits should take courage from the penetrating analysis of challenging problems expounded by W. B. Donham, dean of the Graduate School of Business Administration of Harvard University.

Accessible to fundamentals as dean of that institution, the author offers no fantastic program. Nevertheless, his work is a ringing contribution to liberal thought about an economic era rapidly approaching modification, and it should challenge the business leaders of the country to take their coats off and go to work.

The introduction by Professor Whitehead also deserves more than passing praise. It is a hopeful sign of regeneration when the philosopher contributes thoughts to big business even if it is only to the extent of helping business men to know themselves and to appreciate their true place in the community and their obligations to society. It is the philosopher who is best fitted to identify the collapse of an old regime or predict the entrance of a new epoch. Dr. Whitehead's virtue is the vision of Plato.

As surely as there exist underlying currents to demand the inquiry in this book, it is the part of wisdom to cooperate intelligently for self-preservation rather than lose the good features of the present business civilization. And most helpful to this end should "Business Adrift" prove in approaching the problems which it hypothecates.

PERSONAL MENTION

Changes Are Made in Philadelphia Rapid Transit

Messrs. Myers, Queeney and Joyce Are Deposed as Directors. R. T. Senter and R. F. Tyson Retained. Careers of the New Directors Are Reviewed

With the elimination of Mitten Management from the affairs of the Philadelphia Rapid Transit Company Dr. A. A. Mitten becomes merely a director of P.R.T. His continuance has been regarded as extremely desirable because of his intimate knowledge of the Mitten plan of co-operation between the company and the men founded by his father, and his own long and friendly associations with the employees, while R. T. Senter, as the practical operating head of the company, is also being retained.

Messrs. Myers, Queeney and Coleman J. Joyce, the leaders in Mitten Management, with Dr. Mitten, since the death of Dr. Mitten's father, and before T. E. Mitten's death his chief lieutenants in company management, disappear from the company completed. R. F. Tyson retires as a director, but continues as vice-president in charge of operation.

Messrs. McCarthy, McKinnon, Patterson, Gribbel, Talbot and Tily, the six business men named by Judge McDevitt to assume the new control represent a cross-section of the city's highest business circles.

Careers of New Directors Reviewed

For many years John A. McCarthy was a close associate of the late George H. Earle, Jr., and has been a factor in the Real Estate Trust Company since its reorganization in 1906. He is 58, a lawyer by profession and today, besides his executive positions in the trust company and the sugar corporation, is president of the Pennsylvania Warehousing & Safe Deposit Company and vice-president of the Finance Company of Pennsylvania. He is also a director of the Stanley Company of America and the Electric Construction Company.

George V. MacKinnon is 49. He has been in the great Stetson corporation since 1900, rising to treasurer, then to vice-president in charge of finances, and to the presidency in 1928 following the death of J. Howell Cummings. He is a director of the Fidelity-Philadelphia Trust Company, the Philadelphia Manufacturers Mutual Fire Insurance Company and Philadelphia's Goodwill Industries, of which he is also treasurer.

George Stuart Patterson has been a member of McFadden & Brother, cotton brokerage firm, since 1919. Prior to that he was general solicitor of the Pennsylvania Railroad.

John Gribbel has numerous business interests, one of his leading connections being the presidency of the American Meter Company. He is also president of the Tampa Gas Company and a director of the Philadelphia National Bank, Real Estate Trust Company, the Canadian Meter Company, the Kings County Lighting Company, the Constitution Indemnity Company, the Insurance Company of North America, the John B. Stetson Company, the Exchange National Bank, the Alliance Insurance Company, the Alliance Casualty Company, the Fire Assocaition of Philadelphia, the Liberty Mutual Insurance Company, Victory Insurance Company, Indemnity Insurance Company of North America, the Reliance Insurance Company, the Curtis Publishing Company, the Union Transfer Company, the Pennsylvania Sugar Company and the Cities Service Company.

Walter LeMar Talbot is the second of two presidents of the Fidelity Mutual Life Insurance Company in its 53 years' existence. Starting with it as office boy in 1882 he became second-vice-president in 1903; vice-president in 1911, and president in 1914. He is a director and member of the utilities committee of the Philadelphia Chamber of Commerce and a director of the Corn Exchange National Bank and the Real Estate Trust Company.

Dr. Herbert J. Tily was originally chosen by Judge McDevitt as one of the three receivers he proposed, in his decree of April 11, to place in charge of the transit company in order to displace Mitten Management and to reform the P.R.T. affairs. He is best known as president of Strawbridge & Clothier, one of Philadelphia's big stores. When agitation was started to sell the underliers to the city Dr. Tily, as chairman of the utilities committee of the Chamber of Commerce, directed a study of the transit problems of Philadelphia.

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R. A. Weston in Public Accounting

R. A. Weston, connected with the accounting department of the Connecticut Company for several years, has opened an office in New Haven for the practice of public accounting. Prior to his work with the Connecticut Company, Mr. Weston was connected with the New York, New Haven & Hartford Railroad, and for nine years he was general storekeeper of that company and its subsidiary electric lines.

During the last ten years Mr. Weston has served on the executive and other committees of the American Electric Railway Accountants' Association and has been a contributor of articles on accounting and storekeeping subjects to the Electric Railway Journal and to *Railway Age*.

In his accounting practice, Mr. Weston will include special investigations and reports with respect to organization and system in accounting and store departments of electric railways and companies operating bus lines.

R. T. Sullivan in Receiver's Post at Tacoma

Richard T. Sullivan, former manager of the Tacoma Railway & Power Company, Tacoma, Wash., has been appointed successor to Scott Z. Henderson, resigned, as receiver for the Puget Sound Electric Railway, by Judge Edward E. Cushman. Mr. Henderson's total compensation was fixed at $60,000, of which he had already received $41,939. Frank D. Oakley, attorney for the retiring receiver, was allowed $30,000 as full compensation in closing the affairs of the old Tacoma-Seattle electric line. Operation of the line ceased on Dec. 30, 1928. Mr. Henderson was appointed receiver in February, 1928. He declared that he devoted all of his time during the first year to the line's business, and about 25 per cent of his time after that. The interurban's property already disposed of has brought approximately $350,000.

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Employees Honor Retiring Official at Wheeling

C. R. Bendell, who recently resigned as superintendent of the Wheeling Public Service Company, Wheeling, W. Va., and Bus Transportation Company, a subsidiary, after serving many years with the organization, was presented May 11 a watch and chain by employes at an informal gathering in the company's offices. R. E. Grimes on behalf of the employees commented on the long service by Mr. Bendell with the organization and of the feeling of affection between the head of the company and its employees. Mr. Bendell has been with the organization since 1910. On the back of the watch are Mr. Bendell's initials, while on the inside of the case is engraved, "From the Employees of the Wheeling Public Service Company and Bus Transportation Company to C. R. Bendell" and the date.

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Simon Glerum Made Secretary and Treasurer at Grand Rapids

Directors of the Grand Rapids Railroad, Grand Rapids, Mich., have elected Simon Glerum secretary and treasurer of the company to fill the vacancy caused by the recent death of W. E. Livingston. Mr. Glerum has been assistant secretary and assistant treasurer. He is succeeded in those positions by Ray A. Poteracke, who will continue as chief clerk of the company.

Mr. Glerum was born in Grand Rapids. He began his business career as a member of the clerical staff of the law firm of Kingsley & Weeks in that city, but left this firm to be private secretary to Congressman Carl E. Mapes in Washington. In 1914 he went to the Grand Rapids Railway, predecessor of the Grand Rapids Railroad, as private secretary to Benjamin S. Hanchett, vice-president and general manager.

In 1920 Mr. Glerum became private secretary to L. J. DeLamarter, who succeeded Mr. Hanchett as vice-president and general manager. Mr. Glerum continued in this position until January, 1927, when he was elected assistant secretary and assistant treasurer.

Mr. Poteracke has been with the company since 1917, entering the service as an accountant in the stockkeeping department. Later he was promoted to be head bookkeeper and then to chief clerk in the general offices.

Frank R. Phillips Made President of Philadelphia Co.

Frank R. Phillips has been elected president of the Philadelphia Company to succeed John J. O'Brien, president since May, 1929. At that time, Mr. Phillips was elected senior vice-president of the company. The Philadelphia Company and its subsidiary and affiliated companies are included in the system of the Standard Gas & Electric Company.

Mr. Phillips is a nationally known figure in the public utility industry. He went to Pittsburgh in 1909 to assist in the development of the street railways of that city. In 1910 he was made superintendent of equipment of the Pittsburgh Railways, and in July, 1923, was made acting general manager for the receivers. Upon the lifting of the receivership in February, 1924, he was appointed mechanical and electrical engineer and also representative of the company to the Traction Conference Board. On Sept. 1, 1926, he was elected vice-president and general manager of the Duquesne Light Company and its subsidiaries, and in April, 1928, was elected vice-president of the Equitable Gas Company and its subsidiaries. On May 24, 1929, he became senior vice-president of the Philadelphia Company and president of its affiliated corporations. He has been active in the affairs of the American Electric Railway Association, having served on many important committees, is a past president of the Pennsylvania Street Railway Association, the American Electric Railways Engineering Association and the Pennsylvania Electric Association.

Westinghouse Promotes J. M. Lessells

John M. Lessells, formerly manager of the mechanics division of the Westinghouse Research Laboratories, has been appointed manager of engineering in the South Philadelphia works of the company, to succeed A. D. Hunt, resigned.

Mr. Lessells was born in Dunfermline, Scotland, in 1888. He attended Heriot-Watt College, Edinburgh; the University of Edinburgh; and the University of Glasgow. From the latter institution he was graduated in 1915 with the degree of Bachelor of Science in Engineering, both mechanical and electrical. He was Lauder-Carnegie scholar at Glasgow in 1911. He has been with the Westinghouse Company since 1920.

C. A. Muth New York Railways Auditor

Charles A. Muth has been appointed auditor of both the Fifth Avenue Coach Company and the New York Railways, New York City, succeeding the late George V. Owen.

Mr. Muth was born in New York in 1884. He attended grammer and high school and specialized in accounting at New York University and Pace Institute. His start in business led to a clerkship and bookkeeper's job with the National Shoe & Leather Bank and later the National Bank of Commerce. Well grounded in accounting procedure in banking, he turned to the public utility field by joining New York City Railway in 1904 as a clerk. He was selected soon after to establish a cost system for the Metropolitan Street Railway. Upon his return to the accounting department he was appointed assistant chief clerk, and through a series of progressive appointments became assistant auditor of both the New York Railways and the Fifth Avenue Coach Company, which acquired control of the railway in 1926.

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Lucius S. Storrs, president of the United Railways & Electric Company, Baltimore, Md., has been elected one of the charter directors of the Baltimore Association of Commerce.

New Officers for Shore Line

At a reorganization meeting of the New Haven & Shore Line Railroad, at New Haven, Conn., held recently, Frederick C. Spencer was elected president, Clarence Blakeslee, vice-president, and Harold A. Blakeslee, secretary-treasurer. Eugene Sullivan, who has been secretary, was not re-elected. He represented Kingston interests. New directors include Clarence Blakeslee, Harold Blakeslee, Dr. Frederick Sperry, Benjamin L. Slade, James Fahy, Emil Frieda, Robert A. Lively, Mr. Spencer, and Edward J. Daly. Mr. Slade, as receiver for the Kingston Company, controls the majority stock of the railroad.

Clinton D. Smith Made Philadelphia & Western Manager

C. D. Smith

Thomas Conway, Jr., president of the Philadelphia & Western Railway, has announced the appointment of Clinton D. Smith as general manager of the lines which provide rapid transit service to Bryn Mawr, Villanova, Wayne, Strafford, Norristown and many other of Philadelphia's rapidly developing suburban communities. In July, 1927, Mr. Smith accepted the newly created position of superintendent of personnel with the Cleveland Railway, Cleveland, Ohio, and effected in a four-year period a comprehensive program of industrial relations. He instigated a personnel or management study, particularly among the transportation department employees, for the promotion of the economic principles of transportation service. The training or sales program developed was successful not only in securing a better mechanical performance on the part of the transportation employee, but also higher standards of personnel service.

In taking up his new operating responsibility, Mr. Smith will co-ordinate his more recent sales development with that of operating experience secured as general manager of the Beaver Valley Traction Company, New Brighton, Pa., and as general superintendent of the Penn-Ohio System in Youngstown, Ohio.

Mr. Smith was graduated from Worcester Polytechnic Institute in 1912. This training was followed with four years practical experience in the several departments of the Public Service Railway of New Jersey. In 1916 he went to Youngstown as superintendent of schedules and traffic, soon becoming superintendent of transportation. In 1923 he resigned as general superintendent to become general manager of the Beaver Valley Traction Company.

Mr. Smith believes that most transportation problems should be analyzed as those of sales, which call for the collection of facts in the field and among the trainmen—that is, the sales force. He feels that the possibilities of the employee as a potential sales force has in but few instances been fully developed, but that this reservoir if once tapped and then constantly developed, will regain much of the revenue lost by competitive forces, presaged of course on speedy and comfortable service.

He has been active in committee work of the American Electric Railway Association and in recent years has served as chairman of the Committee on Transportation Empolyee.

Thomas C. Moore's Duties Enlarged

When the operation of the interurban cars between New Castle and Youngstown, and Warren and Youngstown, was centered recently in Youngstown, Ohio, the change brought to the superintendency of the reunited interurban lines Thomas C. Moore, to whose duties as superintendent of the West End Traction Company was added the operation of the East End line as well.

Mr. Moore has been in the employ of the company continuously for 27 years. He signed up as a conductor with the old Mahoning Valley Street Railway. When the World War made the superintendent of employment a key position in keeping the wheels turning, Mr. Moore was appointed to that post, and continued in it till the end of the War brought about a readjustment of labor conditions. He was then transferred to the newly created position of chief instructor of motormen and conductors, with headquarters at Haselton. On Sept. 10, 1921, he was appointed superintendent of the West End lines, including the Youngstown-Warren-Leavittsburg interurban line and the Warren city service, with headquarters in Niles. He continued in that position till the recent change, when the Niles carhouse was closed and operation was started from the Haselton carhouse, with the New Castle line as an added responsibility.

J. C. McQuiston Retires From Westinghouse Company

J. C. McQuiston, general advertising manager of the Westinghouse Electric & Manufacturing Company, has announced his retirement effective June 1, 1931. It is understood that he will start on an extended cruise around the world with his wife and daughter. In his decision to retire from Westinghouse, he brings to an end a record of continuous advertising administration for one company unparalleled in American industry.

Gifted with a most pleasing and dynamic personality, and combining the abilities of analyst, speaker and writer, Mr. McQuiston is one of the best known advertising executives in America. As an advertising man, he has left the imprint of his personality on every branch of his profession. During his career, he has been responsible for expenditures totaling scores of millions of dollars in every form of advertising media. As president of the Association of National Advertisers and as a leader in association work in the electrical and allied industries he is perhaps better known personally to more members of the electrical world than any other man within it.

J. C. McQuiston

During the 29 years that Mr. McQuiston has been in charge of advertising for Westinghouse Electric, the status of advertising and sales promotion, distribution and other allied phases of his profession have gone through as many changes as the electrical industry itself.

Entering the advertising profession when it was in its infancy he contributed greatly to its growth and organization, and by his practice and preaching did much to help raise the ethical standards of the profession. Men long engaged in advertising will remember him for his slogan "Advertising must be truthful," while the modern group are indebted to him for his equally well-known tenet "Advertising and selling must go hand in hand."

In 1920, when the first broadcast was inaugurated on station KDKA at Pittsburgh, Mr. McQuiston arranged its pioneer program. He has been in general charge of all radio programs for Westinghouse broadcasting stations since that time. In this respect his position in radio broadcasting is unusual in that he is the only advertising man privileged to have been a member of the original council of Westinghouse executives who decided to start broadcasting and to whom was entrusted the very important task of laying down the policies and practices to be followed.

He it was who caused the first union of broadcasting station and newspaper when he located a studio in a newspaper plant and used news bulletins as program material. In all the years during which broadcasting has developed, the pioneer programs of the Westinghouse Company, which he developed, and the ethics of program work, for which he was responsible, have served as the basis upon which all broadcasting programs have been founded.

As a young man just starting out in life, Mr. McQuiston had the benefit of contact with the dynamic personality of the late George Westinghouse. This was an influence that Mr. McQuiston has on more than one occasion gratefully and gracefully acknowledged. Only recently he said: "Mr. Westinghouse's forceful character had a tremendous influence on my whole business life. I have found his influence pervading the entire Westinghouse organization, and, in retiring from active work, my greatest regret is the severing of the happy relations with my associates in the Westinghouse Company."

Mr. McQuiston, born at Sandy Creek, Pa., near Pittsburgh, on Sept. 5, 1875, received his early education in the public schools of Wilkinsburg and then attended the Iron City College, Pittsburgh. On Oct. 1, 1891, he entered the employ of the Union Switch & Signal Company, Swissvale, Pa., but left this position on March 3, 1892, to accept another with the Pennsylvania Railroad in Pittsburgh. After serving with this company for about six years in clerical work, he entered the employ of the Westinghouse Electric & Manufacturing Company under Arthur M. Warren, at that time head of the Westinghouse Companies' publication department. When Mr. Warren resigned some five years later, Mr. McQuiston was made head of that department, which directed the advertising and prepared the popular literature for the Westinghouse interests. In April, 1910, the Westinghouse bureau of publicity and the publication department of the Westinghouse Electric & Manufacturing Company were consolidated, and Mr. McQuiston was made manager of the newly formed department, in which capacity he has since served.

J. H. Porter Reappointed to Missouri Commission

John H. Porter, St. Louis, Mo., has been reappointed to the Missouri Public Service Commission to serve for a six-year term to expire in April, 1937, but S. M. Hutchison, Kansas City, whose term also expired on April 15, will hold over until Governor Caulfield has determined on his successor. Messrs. Porter and Hutchison are Democrats. Mr. Hutchison is understood to have declined to consider reappointment in order to carry out plans which he has made to move to California. Mr. Porter is the only engineer member of the commission.

L. G. Ireland Vice-President at New Orleans

Lyall G. Ireland has been elected to the vice-presidency of New Orleans Public Service, Inc., New Orleans, La., operating the railway and light systems there. For the past five years Mr. Ireland has been the assistant to the vice-president of the company.

Mr. Ireland has been identified with utility companies in the United States and Canada for many years. A native of Canada, Mr. Ireland was graduated from the University of Toronto, in the class of 1908. He entered business with the Midland Construction Company, the construction organization of the Electric Power Company, Ltd., of Toronto. In 1912 he became manager of the Brantford Hydro-Electric System, Brantford, Ont. Six years later he associated himself with the Hydro Power Commission of the Province of Ontario, as manager of its central Ontario system. He remained in this posiiton until 1924 when he went to New Orleans as the manager of the Citizens Light & Power Company. This company was later purchased by the Consumers' Electric Light & Power Company, and Mr. Ireland became the vice-president of the latter.

L. G. Ireland

In 1926 the New Orleans Public Service purchased both of these companies and Mr. Ireland was made assistant to the vice-president of New Orleans Public Service, remaining in that capacity until his recent election to the vice-presidency.

It has also been announced that E. S. Myers, for several years assistant to the vice-president of New Orleans Public Service Inc., has been made assistant to the president. Mr. Myers is a graduate of the engineering school of Purdue University. He became connected with the company at New Orleans in 1923 as superintendent of the railway department. In March, 1925, he was made assistant to the vice-president and served in that capacity until his recent promotion.

Work of Efficient Woman Rewarded by Wheeling Road

Miss Margaret Stamm has just succeeded Carl R. Bendell, resigned, as manager of the Wheeling Public Service Company, Wheeling, W. Va. She finds the operation of a street railway just as "fascinating" today as she did when a girl in her 'teens, just out of school, she took a clerical position in the office of what was then the Wheeling & Elm Grove Railway. Her interest and efficiency were so great that it was only a few months after her services began with the railway that she became secretary to the manager.

For twelve years, Miss Stamm was secretary to successive managers of the company. Today as manager of the line she is assistant to the general manager, F. W. Samworth, who is stationed in Huntington, W. Va. She is the active manager of not only the Wheeling Public Service Company, but also to the Bus Transportation Company, which operates bus lines within the city proper and to West Alexander, Pa.

"I can imagine nothing more fascinating," declared Miss Stamm, when interviewed by a representative of ELECTRIC RAILWAY JOURNAL. "The business here has always seemed part of my very existence.

"Women are proving they can fill important executive position as well as men; more and more they are proving their worth in business and industry. They have successfully disproved the old theory that the only tasks the female could perform were menial ones.

"With competition growing keener all the time, electric railways must cultivate the good will of the public, for it is from the public our revenues are derived. That's what we are trying to do here."

Miss Stamm was particularly emphatic in the belief that electric railway executives should maintain at all times friendly relations with representatives of the newspapers. She said operation of a utility was a business in which the public was interested, and that the people had the right to know the facts.

The Wheeling Public Service Company is a subsidiary of the Central Public Service Company, with headquarters in Chicago. Originally it was a horse car line, operating between Wheeling and Wheeling Park, 4 miles east of the city, a section now within the city limits. The line, started in 1873, was extended from time to time until it reached West Alexander, Pa., 16 miles east of the city.

Having during her life never been employed in any other business, and finding that business "fascinating" at all times, Miss Stamm is well-grounded in railway work. A measure of her responsibility is indicated by the fact that the local company hauled 2,803,610 passengers on its cars and buses during the past year.

Miss Stamm is slight of build, with a keen, searching eye, but ever smiling and not one whit worried at the prospect before her in assuming her new and greatly increased responsibility.

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C. Milo Davis, now retired and living with his daughter at Atlanta, Ga., was recently honored with the jewel decoration symbolic of 60 years continuous service in the Independent Order of Odd Fellows. Born in Stowe, Mass., in 1841, Mr. Davis moved to Poughkeepsie, N. Y., where he was superintendent of the Poughkeepsie & Wappingers Falls Electric Railway for 28 years, starting out with the parent concern when it was an embryonic public utility with cars drawn up the hills surrounding Vassar College by means of horses. He was president of the Board of Public Works at Poughkeepsie until the time of his retirement ten years ago.

S. T. Dodd Honored on Retirement

Members of the transportation engineering department and women guests, to the number of 140, gathered at Hunters' Lodge recently as a testimonial to Mr. and Mrs. S. T. Dodd. Mr. Dodd is retiring from active work with the General Electric Company on June 1 and will take up his residence in the family homestead in Stephentown, N. Y.

Mr. Dodd has been a member of the transportation engineering department since 1904. He was graduated from Princeton University with the degree of Bachelor of Arts in 1887. Following his graduation he took up teaching, acting as instructor at Princeton in electrical engineering and physics. During this period he took advanced work and received the degree of Master of Arts in 1890 and that of electrical engineer in 1893.

Prior to his work in the locomotive design department of the General Electric Company at Schenectady, he was employed for three years by the Stanley Electric Manufacturing Company at Pittsfield, Mass. This company was afterwards absorbed by the General Electric. For a number of years he was engaged in the design of electric locomotives with A. F. Batchelder, and later was concerned with various general engineering problems for transportation equipment, including gas-electric cars, and, more recently, oil-electric locomotives. He is the author of numerous papers in the technical press and has contributed to the proceedings of the American Institute of Electrical Engineers and to other technical societies.

Mr. Dodd was born in China. A few years ago he revisited that country as a representative of the International General Electric Company.

Col. E. C. Rose A Director of New Jersey Company

At the annual meeting of the board of directors, Col. Edward C. Rose, Trenton, was elected a director of Public Service Corporation of New Jersey and underlying companies including Public Service Coordinated Transport, to fill the unexpired term of David Baird, Jr., who recently resigned. Colonel Rose is president of the First-Mechanics National Bank, Trenton. In 1927 he became president of the First National Bank of Trenton and in 1928, when the First National was merged with the Mechanics National Bank, Colonel Rose was elected chairman of the executive committee. On the death of Arthur H. Wood, president, Colonel Rose was named in his place.

Colonel Rose is commander of the 112th Field Artillery Regiment, National Guard of New Jersey, and is a member of the executive council of the United States Field Artillery Association. He has been active in civic and charitable work in Trenton and was awarded the Trenton *Times* cup for 1929 as the most outstanding citizen of Trenton in civic affairs for that year.

Indiana Commission Appointments Announced

Harry K. Cuthberton of Peru, a state senator, has been appointed a member of the Public Service Commission of Indiana by Governor Leslie. At the same time, the Governor announced the reappointment of Commissioner Howell Ellis, of Indianapolis. Senator Cuthberton will succeed to a democratic post on the commission now held by Commissioner Calvin McIntosh, whose four-year term expired on May 1.

Senator Cuthbertson has practiced law at Peru for eighteen years. While a member of the Senate during the last general assembly, he introduced several bills bearing on public utility matters, one of which was a measure to regulate truck and bus operations.

Commissioner Ellis served as secretary of the commission from April, 1925, until his appointment as commissioner. He is a graduate of DePauw University. Prior to his association with the commission, he was connected with the state department of public instruction. He also was a reporter on the Indianapolis *Star*.

John W. McArdle and Fred C. King have been reappointed chairman and secretary, respectively, of the commission.

A. C. Proudfoot to Manage Tygarts Valley

Arthur C. Proudfoot, master mechanic of the Tygarts Valley Traction Company, Grafton, W. Va., has been made general superintendent of transportation for the company, succeeding in part to the duties of E. W. Alexander who retires on April 1 as general manager and purchasing agent.

G. T. Vance, secretary of the Retail Credit Association, will become assistant secretary and treasurer.

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Clarence H. Howard has resigned as chairman of the board of the General Steel Castings Company. Clarence H. Howard, Jr., manager of the foreign department of the General Steel Castings Company, and E. Howard Hooper, assistant to the father, have also resigned. It is understood they will be associated with the elder Howard in a new business undertaking not revealed.

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Charles C. Malone has been appointed assistant auditor of the New York Railways and the Fifth Avenue Coach Company, New York City. "Charlie" Malone has been "through the mill" in the thirteen years he has been with the Fifth Avenue Company, having started his career as a clerk assigned to check tire mileage.

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Frank Thornton, Jr., manager of residence engineering of the general engineering department of the Westinghouse Electric & Manufacturing Company, has been appointed manager of association activities of that company. He succeeds R. W. E. Moore, resigned. Mr. Thornton was graduated from the University of Missouri in 1908 with the degree of B.S. in Electrical Egineering.

OBITUARY

F. A. Estep

F. A. Estep, aged 82, former chairman of the board of directors of the R. D. Nuttall Company, died recently in St. Petersburg, Fla. In 1870 Mr. Estep went to Oil City, Pa., as freight agent for the Allegheny Valley Railroad. In 1887 he went to Chattanooga, Tenn., as a partner of the firm of F. I. Stone & Company, dealers in mill and industrial supplies.

Returning to Pittsburgh in 1892, Mr. Estep was employed by the Philadelphia Company. The same year he was appointed auditor of the Allegheny Heating Company, a subsidiary of the Philadelphia Company.

In May, 1893, when the Allegheny Heating Company acquired controlling interest in the R. D. Nuttall Company, Mr. Estep was elected president and treasurer. These offices he held until 1925 when he was elected chairman of the board of directors, in which position he continued until he retired in 1928.

Although the Westinghouse Electric & Manufacturing Company acquired the R. D. Nuttall Company in 1896 the latter concern continued as a subsidiary until 1928 when it was merged with the parent company and became the Nuttall Works of the Westinghouse Company.

During the time Mr. Estep served as the head of the R. D. Nuttall Company, it became a leader in the development and manufacture of gear products for electric railway, mining and industrial service. He was a former member of the American Electric Railway Association of the American Gear Manufacturers Association.

Joseph Y. Johnson

Joseph Y. Johnson, 72 years old, maintenance engineer for the St. Louis County lines of the St. Louis Public Service Company, died at his home in St. Louis County early on May 19 of heart disease. He had been in the maintenance department of the St. Louis Public Service Company and its predecessor, the United Railways, for 25 years. He was a member of the St. Louis Camp No. 4, United Spanish War Veterans, and formerly was state commander of that organization. Prior to the Spanish-American War he was captain of a Kentucky National Guard regiment.

W. E. Sanderson

William E. Sanderson, long superintendent of the Wason Manufacturing Company, Springfield, Mass., now a branch of the J. G. Brill Corporation, died in that city on April 26 of pneumonia, at the age of 72. He entered the employ of the Wason firm at the age of twenty years as a helper in the body department. Later he became foreman, and then timekeeper for his department and eventually for the whole establishment. After a short absence he returned to the concern as superintendent in the early '80's, and held the post continuously until 1916. Beginning in 1897 he was active in politics, serving as councilman and alderman and also as representative in the State Legislature. He was Mayor for three terms. During this period his duties with the car company were lightened so that he could devote the necessary time to his official tasks. He resigned from the company to take a full-time post as member of the assessors' board, of which he was chairman for most of the time until his death.

Charles Day

Charles Day, chairman of the board of Day & Zimmermann, Inc., died on May 10 in the University Hospital, Philadelphia, after an illness of ten days. He was in his 53d year.

As the Philadelphia *Ledger* said, in the death of Charles Day, Philadelphia loses one of its most able and distinguished engineers. Head of the firm of Day & Zimmermann for many years, Mr. Day had a wide experience in the management of public utilities, and his deep interest in the subject of scientific management was given ample scope by its practical application to the many industrial enterprises with which his firm was concerned. During the World War he was able to render conspicuously useful service in France in expediting the movement of the American troops and in the shipment and distribution of munitions and other supplies for the United States Expeditionary Forces. His interests were not confined solely to his profession, for as a manager of the Franklin Institute and a trustee of the University of Pennsylvania, of which he was an alumnus, his public services were many and valuable His published treatise on "Industrial Plants" has long been a standard work of reference on the subject.

Charles Day

Mr. Day was a native of Philadelphia and a graduate of the University of Pennsylvania. After a connection with an engineering company in Nicetown he aided in founding the firm of Dodge & Day in 1902, and five years later, when John E. Zimmermann entered the business, the name was changed to Day & Zimmermann, Inc. So firm a grasp had he of production methods and problems that he lectured for seven years on these and related subjects at the graduate school of business administration of Harvard University and also at Columbia and Lehigh. It was about 25 years ago that Day & Zimmermann, Inc., extended its activities to include the public utility industry.

Mr. Day served on the directorate of the Pennsylvania Railroad, Interborough Rapid Transit Company, United Gas Improvement Company and Fidelity-Philadelphia Trust Company. As indicated previously, he was a trustee of the University of Pennsylvania and was active in other work, having been a member of the board of managers of the Franklin Institute and a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, the American Philosophical Society and other associations.

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Edward T. Reeves, retired division superintendent of the Brooklyn Rapid Transit Company, Brooklyn, N. Y., now the Brooklyn-Manhattan Transit Corporation, died at Clyde, N. Y., on May 15, just 24 hours before reaching the 71st anniversary of his birthday.

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J. H. Watley, formerly superintendent of the Valdosta Street Railway, Valdosta, Ga., is dead. He was 45 years old.

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Charles F. Dege, general superintendent of the Clinton, Davenport & Muscatine Railway, Davenport, Ia., died on May 20 in his home in Davenport following an operation. He was a native of Clinton and had been associated with the interurban railway nearly a quarter of a century, serving the past twenty years as general superintendent. He was 51 years old.

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Frederick D. Hoffman, 51 years old, assistant secretary and assistant treasurer of the Chicago Surface Lines, died suddenly on April 23 following an accident in the Belmont Hotel, Chicago, where he lived. Mr. Hoffman had been with the Chicago Surface Lines since 1914. Before that he was with the Chicago City Railway now included in the Chicago Surface Lines system.

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Charles C. Elwell, public utilities commissioner of Connecticut, died at New Haven on May 23. He was 72 years old. He became connected with the commission in 1911 as its chief engineer, resigning at that time as engineer of maintenance of way of the Connecticut Company, operating a state-wide system of electric railways. He had gone with the electric railway four years before, after a long experience in steam railroad work. He was educated at the University of Maine as a civil engineer.

◆

Judge F. E. Hunter, associated with the El Paso Electric Company, El Paso, Tex., as a member of the legal department since July 1, 1921, died on May 9. His connection with the El Paso company began as a member of the law firm of Goggin, Hunter & Brown, and was continued with his present partners. He had practiced law in El Paso since 1886. Mr. Hunter was 73 years old.

◆

St. John Clarke, engineer engaged in the design of the structure of the first New York subway for the Rapid Transit Commission, predecessor of the Board of Transportation, died on May 22. Mr. Clarke resigned from the commission in 1905 to take the position of chief engineer on the construction of the Steinway Tunnel, now incorporated as part of the Queensboro subway. He had a vast experience on railroad work and the design and erection of steel for buildings and bridges. Mr. Clarke was born in Richmond, Va., in 1863.

INDUSTRY MARKET AND TRADE NEWS

One of the new cars for Brooklyn & Queens

Brooklyn & Queens Gets 100 Cars

The Brooklyn & Queens Transit Corporation has recently accepted the delivery of 100 cars ordered in December of 1930. The cars are of the single-end, center-exit type, with a seating capacity of 54 passengers. They are equipped with four 35-hp. motors, inside hung, and special noiseless spur gears of heat-treated steel.

Osgood Bradley Car Corporation built 50 cars of this order; these were equipped with Westinghouse electrical equipment. The remaining 50 were built by J. G. Brill Company and equipped with General Electric equipment.

General specifications of the cars built by Osgood Bradley are as follows:

Type of Unit	One-man, single-end, double-truck
Number of seats	54
Weights:	
Car body	19,000 lb.
Trucks	10,000 lb.
Equipment	9,000 lb.
Total	38,000 lb.
Bolster centers	24 ft.
Length over all	45 ft. 6 in.
Length over body posts	33 ft.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 4¼ in.
Height, rail to trolley base	10 ft 11 13/16 in.
Window post spacing	2 ft. 7¼ in.
Body	Semi-steel
Roof	Arch
Doors	Center and end folding
Air brakes	Westinghouse, straight air
Armature bearings	Sleeve
Axles	Carnegie Steel Co., heat treated
Car signal system	Faraday
Compressors	Westinghouse, DH-16
Conduit	Metal
Control	Westinghouse, type VA
Destination signs	Keystone and Hunter
Door mechanism	Consolidated Car Heating Co.
Energy saving device	Arthur Power Recorder
Fare boxes	Coinpassor
Finish	Dulux
Floor covering	Tucolith laid on Chanarch
Gears and pinions	Westinghouse, noiseless spur
Glass	Crystal sheet. 34-oz.
Hand brakes	Peacock Staffless
Hand supports	Ellcon Co., enamel poles
Heaters	Consolidated Car Heating Co.
Headlights	Consolidated Car Heating Co., WCF
Headlining	Aluminum. 1/16 in.
Interior trim	Statuary bronze
Journal bearings	Sleeve
Journal boxes	Cast steel. railway's standard
Lamp fixtures	Adams & Westlake, dome
Motors	Four Westinghouse 510-A4, inside hung
Painting scheme	Aurora red and citron yellow
Registers	Railway's standard
Roof material	Wood, canvas covered
Safety car devices	Safety Car Devices Co.
Sash fixtures	O. M. Edwards
Seats	Osgood-Bradley, stationary
Seat spacing	27¾ in.
Seating material	Wood slat
Slack adjusters	Westinghouse Form J
Steps	Stationary
Step treads	Feralun
Trolley catchers	Ohio. Brass, No. 13141
Trolley base	Ohio Brass. form 5
Trolley wheels	Ohio brass
Trucks	Osgood-Bradley Type 48-64
Ventilators	Railway Utility Co., exhaust type
Wheels	Carnegie wrought steel, 26 in. diam.
Wheelguards	H.-B.

The 50 cars built by the J. G. Brill Company have the same specifications except as follows:

Weights:	
Car body	18,544 lb.
Trucks	10,178 lb.
Equipment	8,682 lb.
Total	37,404 lb.
Length over all	45 ft. 8 in.
Width over all	8 ft. 4¼ in.
Height, rail to trolley base	10 ft. 5¼ in.
Body	All steel
Control	General Electric, PCM
Gears and pinions	General Electric, non-resonant
Heaters	Railway Utility Company
Headlights	Ohio Brass, type WCF
Interior trim	Aluminum, painted
Motors	Four GE-702-A, inside hung
Seats	Brill, wood slat
Seat spacing	29¾ in.
Slack adjusters	American Brake Co., type J
Trucks	Brill, 177-E-1

◆

Brill Management Wins

At the annual meeting of the J. G. Brill Corporation the vote of 341,326 shares of the Class B voting stock approved every act of the management since the organization of the company in 1926. The vote of 9,636 shares were cast against the management. About 255,000 shares of the outstanding 400,000 shares of Class B are owned by the American Car & Foundry Company. William H. Woodin is president of both companies. Opposition to the management was led by George N. Fleming, Philadelphia.

◆

General Electric Awarded Subway Contract

The Board of Transportation of New York awarded a $2,158,033 contract to the General Electric Company for furnishing and installing all power machinery and equipment needed for the Brooklyn section of the city subway between the Fulton Street tunnel and the Culver line connection of the B.-M.T. The General Electric Company was the lowest of three bidders.

Equipment will be installed in twelve substations and four control rooms. Nine of the substations will be underground. The most expensive of the equipment will be fifteen 3,000-kw. mercury arc rectifiers, to cost $603,750. The installation is to be completed in sixteen months.

When finished it will give to the city a power plant system extending from 210th Street, Manhattan, to the Coney Island connection with the B.-M.T.

Pennsylvania Orders Electrical Equipment for 150 Locomotives

Orders for electrical apparatus to be installed in 150 electric passenger and freight locomotives, constituting part of the equipment which will be used when electrification is completed between New York, Philadelphia, Baltimore and Washington, were announced by the Pennsylvania Railroad. This electrical apparatus will be supplied by the Westinghouse Electric & Manufacturing Company and the General Electric Company at an approximate cost of $16,000,000.

The Pennsylvania Railroad's program also calls for the later purchase of 80 additional electric locomotives of other types. The American Brown-Boveri Electrical Corporation, of Camden, N. J., is in consultation with the railroad with respect to the design of some of them, and may supply a part of the necessary electrical equipment.

Of the 150 locomotives, 90 will be for fast through passenger trains and 60 for high-speed freight service. They have been designed for operating conditions in the dense traffic territory between New York and Washington, and particularly the speedy handling of long and heavy trains. The weight of the passenger engines will be 375,000 lb. each, and that of the freight engines 330,000 lb. All of the electrical equipment has been so designed as to be interchangeable between the freight and passenger locomotives in order to reduce to a minimum the electrical repair parts to be carried in stock.

Mechanical parts, however, differ materially to meet the requirements of the two branches of traffic. The passenger locomotives will have a relatively high starting tractive effort, with capacity to sustain a very high running speed. The freight engines will have extremely high starting tractive effort with a moderately high sustained speed appropriate to the most efficient movement of freight trains.

Two types of passenger locomotives have been designed. One, with two pairs of drivers and two pairs of motors, develops 2,000 hp. at a speed of 56 m.p.h. Its tractive power at this speed is 13,200 lb. The other, with three pairs of drivers and three pairs of motors, develops 3,000 hp. at the same speed, with 19,800 lb. tractive power. Each has a maximum safe speed of 90 m.p.h.

The freight locomotives are equipped with four pairs of driving wheels, and one motor to each pair. They develop 2,000 hp. at 28 m.p.h., with 26,400 lb. tractive power.

The passenger engines have been so designed that the two types may be used separately or in any combination desired. This will permit the movement of passenger trains at the fastest schedules in any length from 8 to 25 cars. Three freight engines used in combination will handle a maximum length freight train between New York and Washington.

Forty-three of the new engines are to be delivered this year and the remainder before the middle of 1933, when it is anticipated that the electrification work between New York and Washington will be completed.

◄ TO BE GOLDEN FOR YOU, MAKE IT YOUR JUBILEE ►

"Community Transportation"—Atlantic City's annual epic staged by the American Electric Railway Association

Manufacturers Falling in Line for the Anniversary Convention Exhibit

Business depression or no business depression, the Exhibit Committee is determined to make this year's convention exhibit one of the best ever—one befitting the 50th anniversary of the American Electric Railway Association. The trials of one fleeting year shall not overshadow the achievements of 49, nor dim their brilliance. The ringing call of a golden jubilee summons all to pay tribute to the half-century of service of the A.E.R.A. Operators and manufacturers will join arm in arm for the march to Atlantic City, and there to add a fifth golden star of service to her sleeve.

No stone has been left unturned by Fred Dell and his co-workers to get the manufacturers in line for the big show. Despite the repeated wails of poor business and the sad stories of drastic budget curtailments, they have made a promising start. Already, more than 100 manufacturers have decided to take part in this annual extravaganza of showmanship with a plethora of new equipment and materials. Many exhibitors are digging up some of the old relics of horse car days to lend a touch of the pioneering spirit to the convention. About 75,000 sq.ft. of choice floor space has been assigned. More space is still available for those who are a bit slow in making up their minds to take advantage of this great opportunity to display their ware before the industry. The committee is continuously receiving applications for floor space, and, no doubt, the list shown below will be greatly augmented before the doors of the spacious Atlantic City auditorium will be thrown open on Sept. 26 to a large group of railway men.

A list of exhibitors for the 50th annual convention of the American Electric Railway Association and space assigned by the Exhibit Committee is shown below.

Company	Space
Adams & Westlake Co	E-620
a.c.f. Motors Co	C-308
Aluminum Company of America	E-628
American Brake Materials Corp	½E-515
American Brake Shoe & Foundry Co	½E-515
American Steel & Wire Co	D-428/430
American Steel Foundries	E-572/573
Anaconda Wire & Cable Co	E-599/600
Automatic Coinwrapping Machine Co.	E-517/519
Automatic Signal Corp	D-404/406
Bendix Brake Co	⅓C-303
Bendix Westinghouse Automotive Air Brake Co	⅓C-303
Bethlehem Steel Co	E-611/2/3/4/5/6
Blanchard Brother & Lane	E-536/538
Bragg-Kleisrath Corp	⅓C-303
J. G. Brill Co	C-315 and Part C-316
Buda Co	D-427
Bus Transportation	Part C-316
Carnegie Steel Co	D-431
L. C. Chase & Co	C-350
Cheatham Elec. Switching Device Co	D-422
Chillingworth Mfg. Co	E-577
Cincinnati Car Corp	C-312
Barron G. Collier, Inc	E-530/531
Consolidated Car-Heating Co., Inc	E-512
Crew Levick Co	C-320
Delco-Remy Corp	C-348
De Luxe Products Corp	C-322
C. I. Earll	E-579
Economy Electric Devices Co	Part C-319
O. M. Edwards Co., Inc	E-524
Electric Railway Improvement Co	E-610
ELECTRIC RAILWAY JOURNAL	E-500/501
Electric Service Supplies Co	E-514/16/18/20
Electric Traction	E-511
Ellcon Co	E-528
Fargo Motor Corp	C-317/318
Ferodo & Asbestos, Inc	C-328
Galena Oil Corp	E-583
General Car & Coach Corp	E-565/6
General Electric Co	E-568
General Leather Co	C-344
General Motors Truck Co	C-309 and C-304
General Steel Castings Corp	E-571
Globe Ticket Co	E-549
Gold Car Heating & Lighting Co	E-548
Hale & Kilburn Co	E-507
Haskelite Mfg. Corp	C-349
Hercules Motors Corp	C-351/2
Heywood-Wakefield Co	E-506/8
Highway Service, Inc	D-420
Hunt-Spiller Mfg. Corp	C-324
Hyatt Roller Bearing Co	E-601
Hyman Register Corp	E-585
Illinois Steel Co	D-429
International Motor Co	¼C-307
International Steel Tie Co	D-401/3/5/7
Johns-Manville Sales Corp	C-326
Kelton-Aurand Mfg. Co	C-346
Leece-Neville Co	C-327
Lorain Steel Co	D-432/3/4/5
P. O. Lund	E-598
McQuay-Norris Mfg. Co	C-345
Macdonald Mfg. Co	E-552
Mack International Motor Truck Corp.	¼C-307
Mack Motor Truck Co	¼C-307
Mack Trucks, Inc	¼C-307
Manganese Steel Forge Co	E-618
Metal & Thermit Corp	Γ-118/19
Multibestos Co	C-343
Nachod & United States Signal Co., Inc.	D-424
National Brake Co., Inc	E-526
National Malleable & Steel Cast. Co.	E-529
National Pneumatic Co	E-513
Norma-Hoffman Bearings Corp	E-594
Ohio Brass Co	E-502/3/4/5
Ohmer Fare Register Co	E-540/2/4
Okonite-Callender Cable Co., Inc	½E-533
Okonite Co	½E-533
Oxalite Corp	D-402
Pantasote Co., Inc	E-554/6/8/560
Perey Mfg. Co., Inc	Part C-319
Pyrene Mfg. Co	E-521/523
Rail Joint Co	D-400
Railway Track Work Co	D-421/3/5
Railway Utility Co	E-562
Rawlplug Co., Inc	C-323
Reo Motor Car Co	C-313
Ross Gear & Tool Co	C-325
Russell Mfg. Co	E-522
Safety Car Devices Co	½E-570
St. Louis Car Co	C-321
Sherwin-Williams Co	E-535/7
Standard Steel Works Co	E-574
Texas Co	E-510
Timken-Detroit Axle Co	C-314
Timken Roller Bearing Co	E-606
Tool Steel Gear & Pinion Co	Part C-319
Triplex Safety Glass Co. of North America, Inc	C-347
Tuco Products Corp	E-509
Twin Coach Corp	C-310
Union Metal Mfg. Co	E-525/7
United American Bosch Corp	E-532
Walter Motor Truck Co., Inc	Part C-319
Westinghouse Electric & Mfg. Co	E-569
Westinghouse Traction Brake Co	½E570
Wm. Wharton, Jr. & Co., Inc	D-416/17
Wheel Truing Brake Shoe Co	E-546
White Co	C-311
Wiener Body Co	Part C-302
Wilson-Imperial Co	E-604
Ypsilanti Reed Furniture Co	E-534
Zenith-Detroit Corp	C-333

Bus Deliveries

Birmingham Electric Company, Birmingham, Ala., three White, Model 65A.

Boston, Worcester & New York, Framingham, Mass., three White Model 54A, one White 64.

Capital Traction Company, Washington, D. C., four Twin Coach, small urban.

Chicago Surface Lines, Chicago, Ill., two A.C.F. trolley buses.

Eastern Massachusetts Street Railway, Boston, Mass., eleven Twin Coach, large urban.

Georgia Power Company, Atlanta, Ga., three Yellow Coach, 21-pass. city type.

Illinois Power & Light Company, Chicago, Ill., three Yellow Coach, 25-passenger city type.

Lincoln Traction Company, Lincoln, Neb., four Yellow Coach, 21-passenger city type.

Levis Tramways Company, Levis, Que., one White, Model 61.

Louisiana Power & Light Company, Algiers, La., one White, Model 613.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., two Yellow, 38-passenger, city type; one Yellow, 21-passenger, city type; six Twin Coach, large urban.

North Coast Transportation Company, Seattle, Wash., two Yellow, Type 250; two A.C.F. and on Mack, Model BK.

Schenectady Railway, Schenectady, N. Y., twelve Twin Coach, small urban.

Third Avenue Railway System, New York, N. Y., ten White, Model 54A.

Toronto Transportation Commission, Toronto, Ont., two White, Model 61.

Worcester Consolidated Street Railway, Worcester, Mass., three Yellow, 38-passenger, city type.

Wyoming Valley Autobus Company, Wilkes-Barre, Pa., five Mack, 29-passenger, city type.

Youngstown Municipal Railway, Youngstown, Ohio, five Twin Coach, large urban.

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Fageol Sales at Peak

Fageol Motors Co., California, reported sales and service revenues during April considerably above $500,000. Deliveries of buses and trucks, and orders on hand for immediate delivery totaled $473,553. The manufacturing plant was placed on full production schedule during April. Two eight-hour shifts are working, giving employment to almost 400 persons. This is the largest force that has been employed during the last eighteen months.

Estimated sales and delivery of completed units for May give every indication of comparing favorably with April sales, which were the peak for the preceding eighteen months. Good volume of business is expected for the balance of the year.

Conspectus of Indexes for May, 1931

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	May, 1931 7.81	Apr., 1931 7.81	May, 1930 7.76	Apr., 1931 7.81	May ,1926 7.35
Electric Railway Materials* 1913 = 100	May, 1931 118	Apr., 1931 120	May, 1930 140	Dec., 1926 159	May, 1931 118
Electric Railway Wages* 1913 = 100	May, 1931 233.2	Apr., 1931 233.2	May, 1930 231.7	Apr., 1931 233.2	May, 1926 225.4
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	May, 1931 185	Apr., 1931 186	May, 1930 201	Nov., 1928 206	May, 1931 185
General Construction Cost Eng'g News-Record 1913 = 100	May, 1931 189.3	Apr., 1931 191.6	May, 1930 205.9	Jan., 1927 211.5	May, 1931 189.3
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Apr., 1931 73.3	Mar., 1931 74.5	Apr., 1930 90.7	May, 1926 100.5	Apr., 1931 73.3
Wholesale Commodities Bradstreet 1913 = 9.21	May, 1931 8.91	Apr., 1931 9.23	May, 1930 10.94	Jan., 1928 13.57	May, 1931 8.91
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Apr., 1931 124.0	Mar., 1931 126.4	Apr., 1930 151.2	Apr., 1926 162.4	Apr., 1931 124.0
Cost of Living Nat. Ind. Conf. Bd. 1923 = 100	Mar., 1931 89.1	Feb., 1931 89.6	Mar., 1930 97.8	Mar., 1926 105.6	Mar., 1931 89.1
General Business The Business Week Normal = 100	May 9, 1931 79.2	Apr. 11, 1931 78.1	May 10 1930 96.9	Oct. 6, 1928 117.6	Jan. 31, 1931 77.0
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Apr., 1931 105.7	Mar., 1931 108.2	Apr., 1930 120.2	Feb., 1929 140.4	Jan., 1931 97.6
Bank Clearings Outside N. Y. City 1926 = 100	Apr., 1931 76.0	Mar., 1931 72.1	Apr., 1930 93.4	Oct., 1929 111.8	Feb., 1931 69.8

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Material Prices

MAY 28, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	8.50
Lead	3.75
Nickel, ingot	35.00
Zinc	3.65
Tin, Straits	22.95
Aluminum, 98 to 99 per cent	22.90
Babbitt metal, warehouse	
Commercial grade	32.75
General service	28.00

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{9}{16}$-in. and larger, per 100 lb.	2.70
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, 6in.x 8in.x8 ft.,	
White Oak, Chicago	1.35
Long leaf pine, New York	1.00

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	8.00–12.00
Colored	7.00–10.00

Wire—New York

Bare copper wire, cents per lb.	10.50
Rubber-covered wire, No. 14, per 1,000 ft.	$4.22
Weatherproof wire base, cents per lb.	12.125

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	9.60
White lead in oil (100lb. keg), cents per lb.	13.25
Red lead in oil	14.75
Turpentine (bbl. lots), cents per gal.	53.00
Putty, com'l grade, 100 lb. tins, cents per lb.	2.75

Hardware—Pittsburgh

Wire nails, per keg	$1.85
Sheet iron (24 gage), cents per lb.	2.20
Sheet iron, galvanized (24 gage), cents per lb.	2.80
Auto body sheets (20 gage), cents per lb.	3.05

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	1.00
Kansas screenings, Kansas City	1.75
Big seam, Ala., mine run	1.70
Smokeless mine run, Chicago	1.60

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N.Y., per sq.yd., f.o.b.	2.50
Paving brick, 3½x8½x4, N.Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.35
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt, in pkg. N.Y., f.o.b. ref., per ton	15.00

Scrap Metal—New York

Heavy copper, cents per lb.	7.25
Light copper	6.25
Heavy brass	4.25
Zinc	2.00
Lead, heavy	3.125
Mixed babbitt	3.125
Battery lead plates	1.125
Cast aluminum	5.00
Auto radiators	4.25

Old Material—Chicago

Steel car axels, net ton	$11.75
Cast iron car wheels, gross ton	9.00
Steel car wheels, gross ton	11.25
Leaf springs, cut apart, gross ton	11.75
Angle bars, gross ton	10.25
Brake shoes, net ton	6.25
Steel rails (short), gross ton	12.00
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	3.75
Coil springs	11.75

◆

National Pneumatic Company, Rahway, N. J., has received contracts, among others, for treadles for 23 buses of the Pacific Electric Railway, and pneumatic equipment for 30 cars of the Pittsburgh Railways and 38 cars of the Omaha & Council Bluffs Traction Company.

Emergency Brakes that Brake—every time!

Peacock Staffless Brakes are dependable . . . when the emergency occurs they are there with lots of power . . . fast on the take up . . . and they never clog with chain *no matter how much slack there may be in the rigging.*

Sturdy, rugged brakes. Light in weight. Compact, take up little platform space. And braking force is 3000 pounds. When you buy specify Peacock Staffless Brakes.

NATIONAL
BRAKE CO., INC.
Buffalo, N. Y.

Canadian Representative
Lyman Tube & Supply Co., Ltd.,
Montreal, Can.
The Ellcon Company—General Sales Representatives, 50 Church St., New York

PEACOCK STAFFLESS BRAKES

WHY DOES "THE MAN WHO CHANGES TIRES

LIKE GOODYEAR K RIMS"?

WHEN the tire and rim are clean and new, almost any rim makes a good demonstration.

Men who change tires don't often get them in that condition.

They more often get them after thousands of miles of service in dirt and water.

That's when the man who changes tires thanks Goodyear for building *split base rims.*

The split base principle was originated for the big pneumatics necessary for trucks today. What Goodyear gives you is not a passenger car rim, made over for trucking sizes — but rims designed, engineered, and developed for truck tire requirements.

Goodyear Type K Rims are the only rims made to fit all wheels. You can get them for wheels with 18° or 28° bevel mountings. You can use the same type straight through your fleet—on large or small wheels.

K-28 sizes: 5", 6", 7", 8", and 9-10" (for 28° bevel mountings).

K-18 sizes: 5", 6", 7", 8", 9-10", and 11" (for 18° bevel mountings).

Give them a test on your fleet. They cost no more. Write to Rim Department, The Goodyear Tire and Rubber Company, Inc., Akron, Ohio.

GOODYEAR

K-28 RIMS K-18

One of the 143 modern coaches of the Oregon Stages Division, Pacific Greyhound Lines, which operate on Goodyears

OVER 1,400 miles of concrete, graveled mountain roads and graded dirt, the Oregon Stages Division of Pacific Greyhound Lines operates its coaches.

In the words of R. W. Lemen, vice president, "the All-Weather tread has given us safety, traction and mileage."

More specifically — the report for January, 1931, shows that Goodyears covered 488,292 bus miles on these motor coaches and over these road conditions with an average of one road change for every 61,287 bus miles.

Like other transportation companies from coast to coast, this great fleet in Oregon has found that it pays to decide, "I will use only THE leading make of tire."

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS

Seal in those profits

A FEW years ago, effective car journal lubrication was practically impossible of attainment — regardless of the quality of the lubricant! Abrasive road dust, dirt and water found ready access to the journal box with disastrous effect in high maintenance costs. • Today, an entirely new system of lubrication, which has overcome all the old difficulties, is rapidly being put into effect. • Texaco car journal Oil Seals have at last provided complete protection to bearing surfaces. Journal boxes equipped with Texaco Oil Seals *are sealed* — permanently preventing entrance of dirt and loss of lubricant — permanently preventing lubrication profit loss. • And with this has come the possibility of using an entirely new and more effective low-viscosity oil — Texaco Lovis Oil. • These two, the new Texaco Lovis Oil and the new Texaco Oil Seals have definitely lowered maintenance costs, oil house labor and waste consumption, and have substantially reduced power consumption. Records of electric lines which have installed this new Texaco Lubrication System show that it is highly profitable — and the cost is surprisingly low. Annual savings are many times the cost of installation. Write The Texas Company for the facts.

TEXACO
REG. U.S. PAT. OFF.

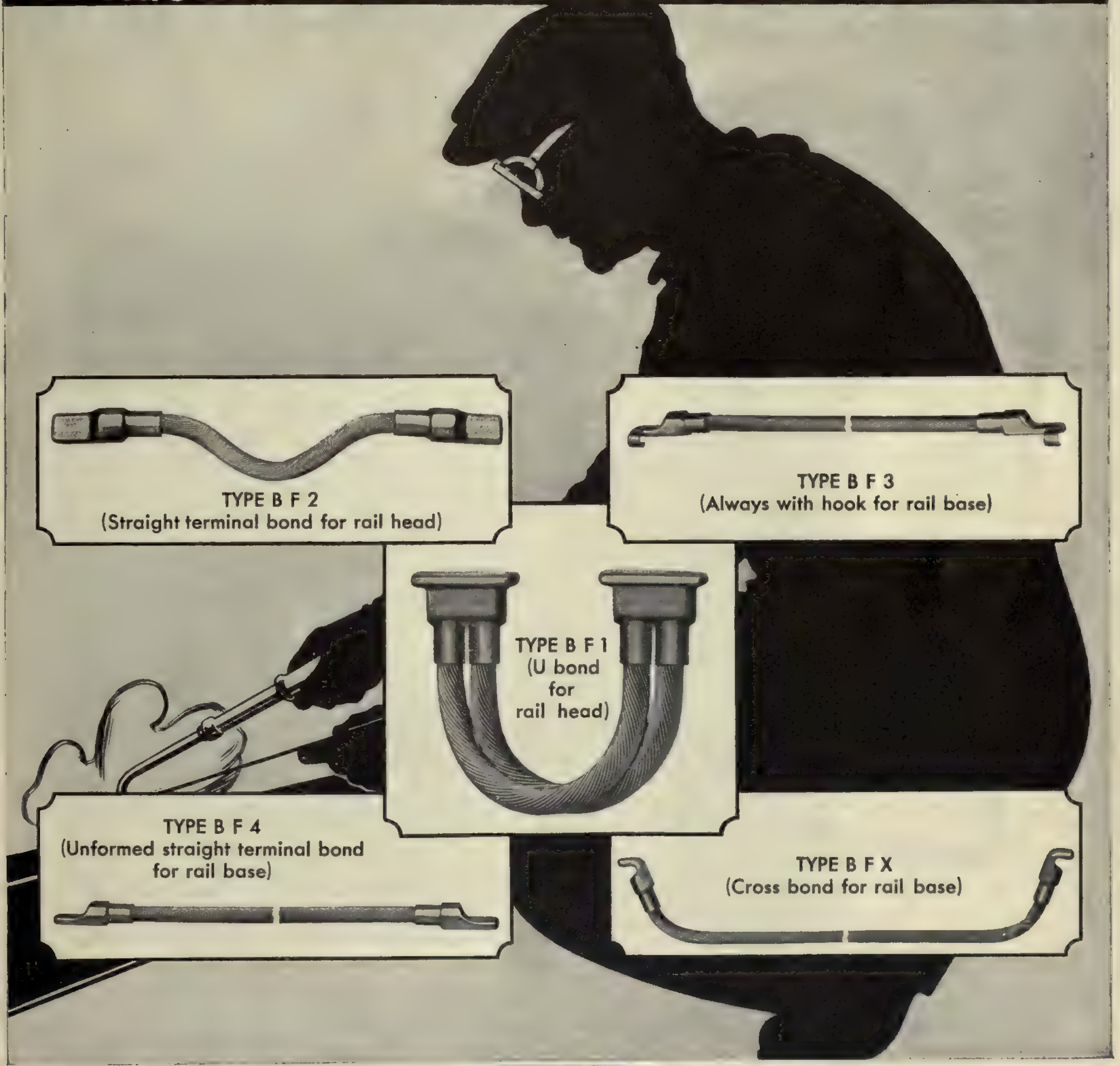
TEXACO LUBRICANTS

THE TEXAS COMPANY
135 East 42nd Street, New York City

TIGER WELD
FLASH ~ BUTT-WELDED
POWER BONDS

THIS latest and most significant advance in power bond design assures welding simplicity and economy never before realized—as well as higher resistance to vibratory stresses. By newly developed manufacturing methods, the wires are intimately flash butt-welded to solid soft steel terminals, making it easy for any welder to give you better installations at lower cost. Five types—adaptable to flame or arc welding—each bond stretch-tested to insure positive unity. Full particulars and samples on request. Address the nearest office.

A TRIUMPH IN PERFORMANCE AND ECONOMY



TYPE B F 2
(Straight terminal bond for rail head)

TYPE B F 3
(Always with hook for rail base)

TYPE B F 1
(U bond for rail head)

TYPE B F 4
(Unformed straight terminal bond for rail base)

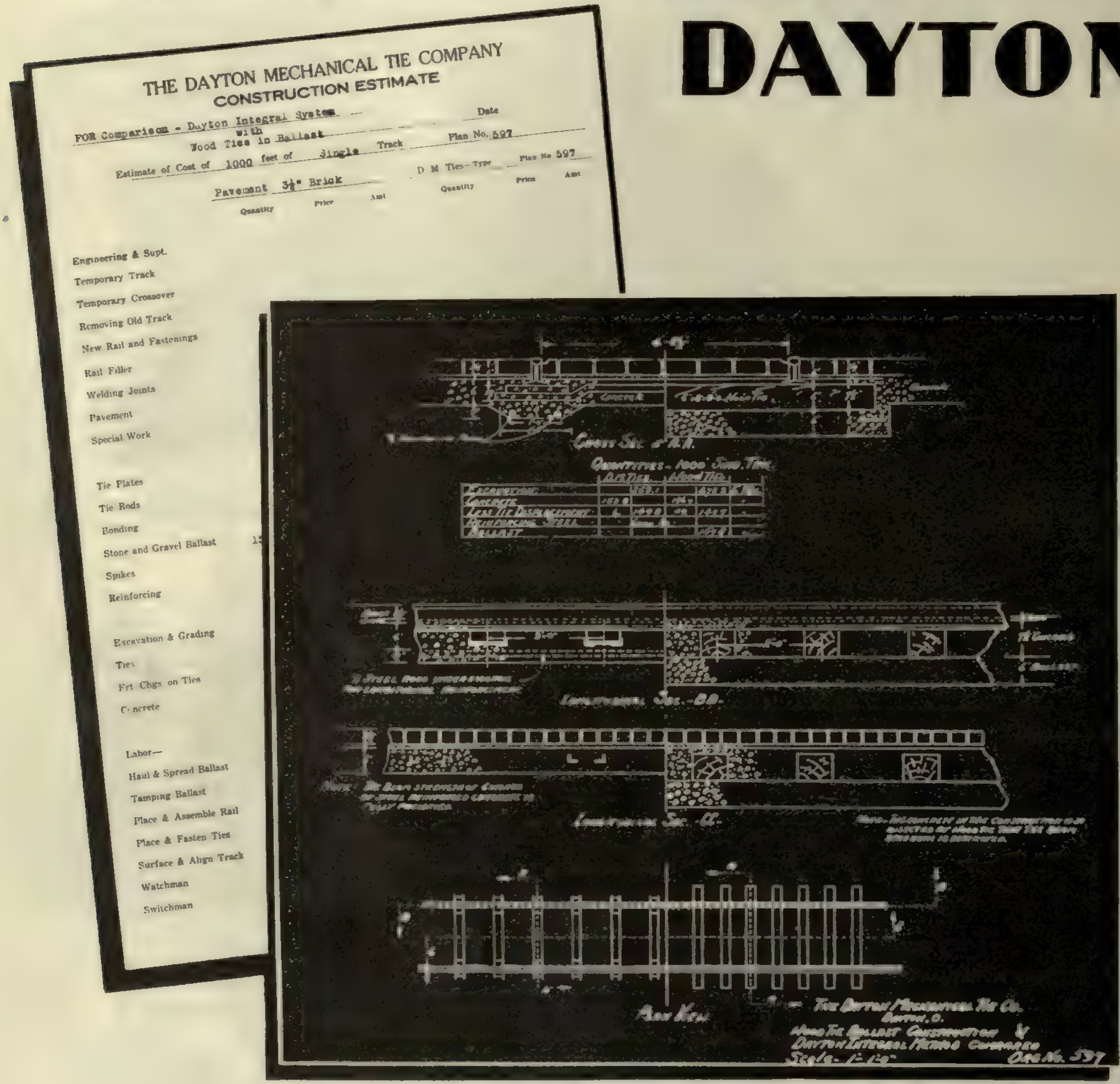
TYPE B F X
(Cross bond for rail base)

1831 COMMEMORATING 100 YEARS of PROGRESS IN WIRE MAKING 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION And All Principal Cities
Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

Let us put the
for you..and show
DAYTON



THE DAYTON MECHANICAL TIE COMPANY
CONSTRUCTION ESTIMATE

FOR Comparison - Dayton Integral System with Wood Ties in Ballast Date

Estimate of Cost of 1000 feet of Single Track Plan No. 597

Pavement 3½" Brick D M Ties—Type Plan No 597

	Quantity	Price	Amt	Quantity	Price	Amt
Engineering & Supt.						
Temporary Track						
Temporary Crossover						
Removing Old Track						
New Rail and Fastenings						
Rail Filler						
Welding Joints						
Pavement						
Special Work						
Tie Plates						
Tie Rods						
Bonding						
Stone and Gravel Ballast	15					
Spikes						
Reinforcing						
Excavation & Grading						
Ties						
Frt Chgs on Ties						
Concrete						
Labor—						
Haul & Spread Ballast						
Tamping Ballast						
Place & Assemble Rail						
Place & Fasten Ties						
Surface & Align Track						
Watchman						
Switchman						

The Dayton
Dayton,

proof in figures you exactly what TIES *will save in . .*

FIRST COST OF INSTALLATION
MAINTENANCE COST
DEPRECIATION CHARGES

JUST send us a sketch and cost data of your standard construction and without obligation our engineering department will make up for you a comparative statement showing exactly what Dayton Ties will accomplish in direct comparison with your standard construction. These figures which embrace every item in track installation are conservatively estimated and will show you savings that you cannot afford to ignore. Why not avail yourself of this opportunity—not only to economize but to improve immeasurably your track structure? There is no obligation for this important service.

Under present economic conditions, increased competition and general decreased revenue—the cost of track structure and maintenance becomes a vital consideration in the improvement of operating statements. The savings made possible by Dayton Ties in the item of maintenance alone—should command the most serious consideration of every car property.

GREATER STRUCTURAL STRENGTH *plus* PROTECTION FROM VIBRATORY ACTION

Mechanical Tie Co.

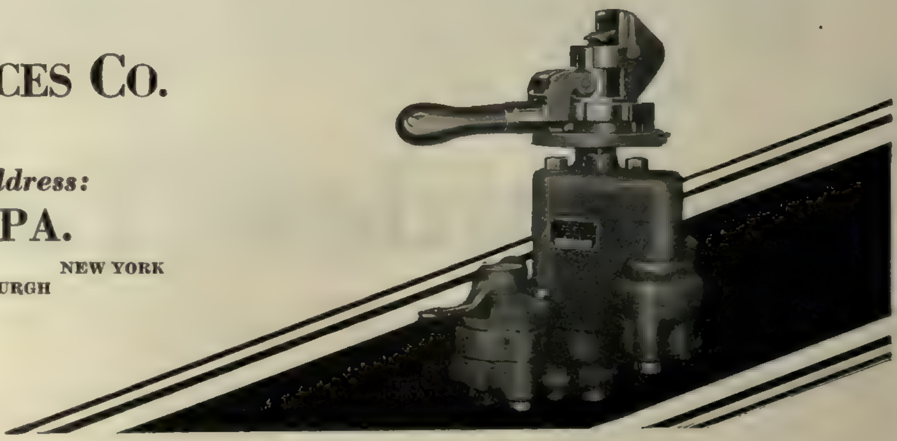
Ohio.

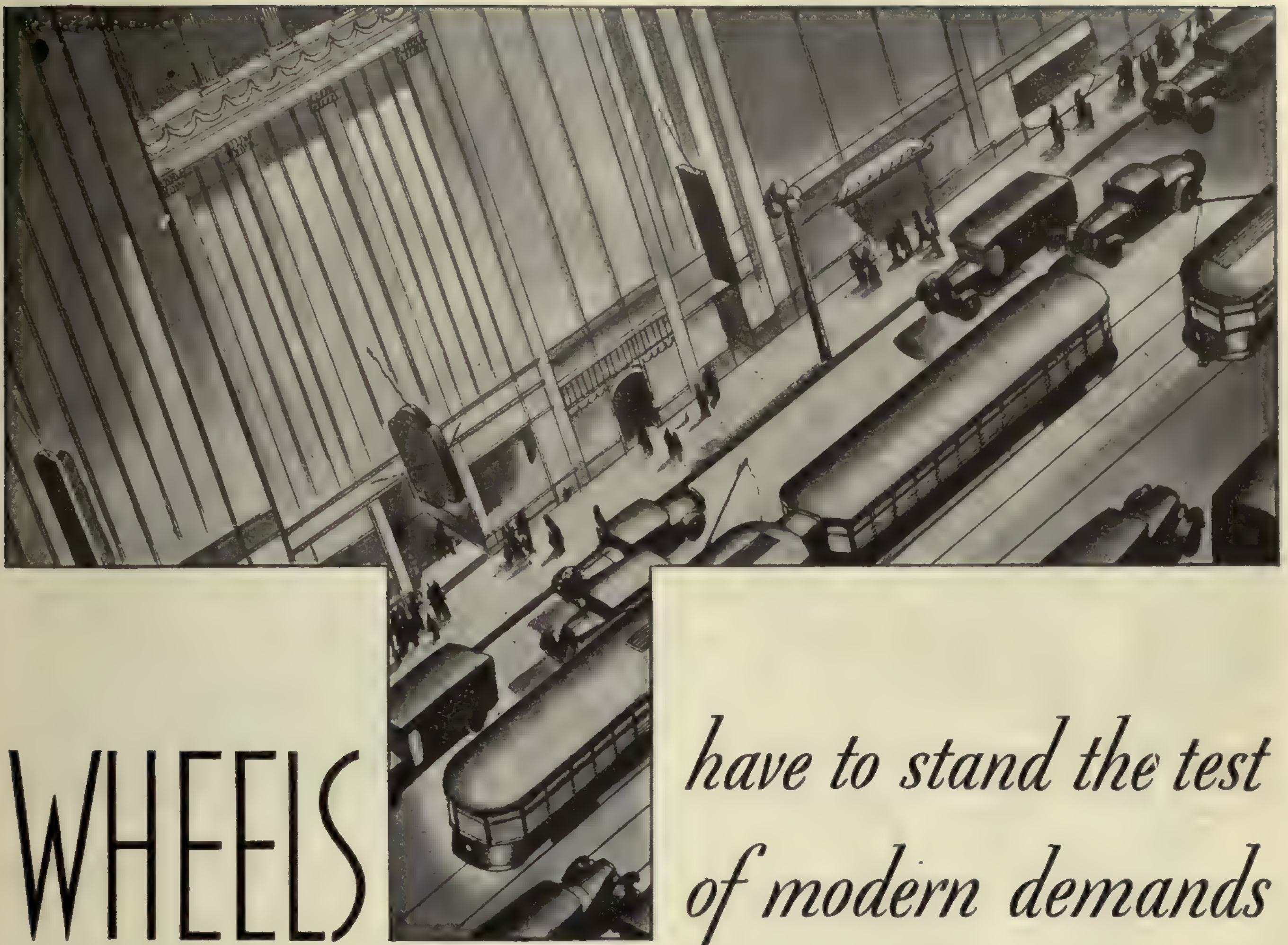
The SAFETY CAR CONTROL EQUIPMENT ▲ ▲ ▲

▲ ▲ Promotes Profitable Service

BETTER and faster service with Safety Cars brings in more gross revenue . . . Economy is realized by centralizing operating responsibility in one man whose duties are safeguarded by devices that interlock car control, door operation, and brake manipulation . . . Since operating cost deductions are less, a greater net revenue remains.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH





WHEELS *have to stand the test of modern demands*

TRAFFIC conditions today—peak loads, rapid acceleration, emergency stopping—all these throw a tremendous burden on equipment, particularly the wheels.

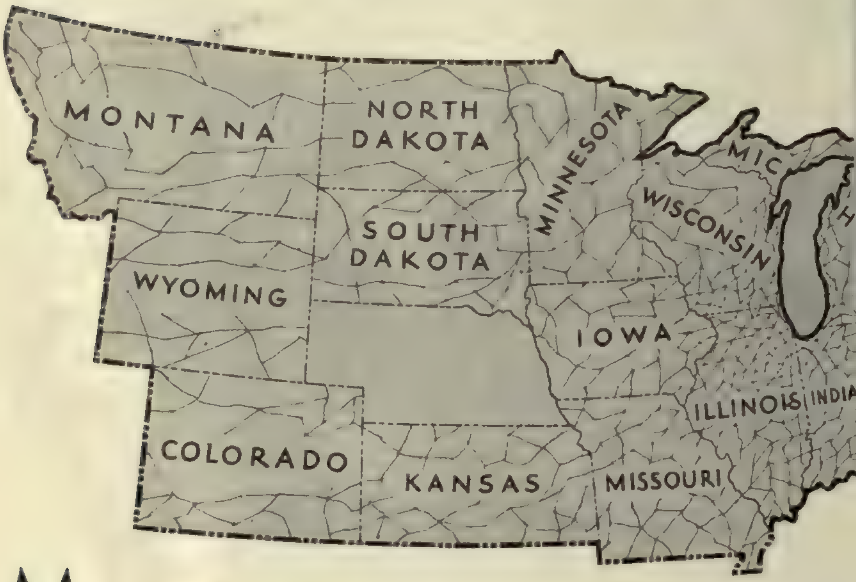
Carnegie Wrought Steel Wheels are built to withstand the stress of modern traffic. Wrought Steel is obtained through rolling and forging. A 10,000 ton hydraulic press (twenty million pounds!) refines the steel—insures a homogeneous structure, free from irregularities that might cause trouble. A rolling process further refines and toughens the wearing surfaces. The result is a wheel of exceptional endurance—of exceptional safety. A wheel fit for any service.

Before you invest in new wheels, investigate the many advantages of Wrought Steel. Literature on request.

CARNEGIE STEEL COMPANY • PITTSBURGH, PA.
Subsidiary of United States Steel Corporation 83

CARNEGIE
WROUGHT STEEL WHEELS

Second lap of great lubrication test has started



The touring tests will give both motor oil and gasoline severe service as the cars must be operated at high speeds to maintain schedules.

MAY 17th marked the start of the second lap of the most comprehensive motor oil test ever to be made. The thirteen popular cars which ran up a total 116,000 miles in the tests conducted by the A. A. A. at the Indianapolis Speedway, are now speeding along on individual tours of the middle west. These cars will travel thousands of additional miles before they return to Chicago in October.

Each car is equipped with a finely balanced instrument board which records oil and water temperatures, tests deceleration and acceleration, shows engine speeds and registers gasoline consumption at various speeds. Constant records of gasoline and motor oil performance in each car will be kept throughout the tours.

During this road test the cars will operate under conditions as severe as those under which motor coaches operate. Each car must maintain its schedule, requiring fast running time over all types of roads. Thousands of observations will be recorded and the facts obtained added to those already gathered from the tests at the Indianapolis Speedway.

USE POLARINE MOTOR OIL

CONTEST BOARD AAA CERTIFIED TEST

Lubrication Study Conducted by the Contest Board of the American Automobile Association

1 During the entire test the engines and chassis of all cars were lubricated effectively.

2 Polarine showed a very low rate of oil consumption.

3 Carbon: only 6.23 grams per cylinder at 30 miles per hour, using heavy grades, average for all cars. Carbon decreased 33% at 55 miles per hour.

4 Cylinder wear: Less than one one-thousandth of an inch in any car for the entire test.

5 Effect of speed on oil consumption: Speed is the chief factor affecting oil consumption. All oils tested at 55 miles per hour showed consumption seven times greater than at 30 miles per hour.

6 The thirteen cars used in the test were regular stock models of latest design, bought by A. A. A. representatives from dealers' floors.

7 Over 600,000 observations were recorded.

At the Speedway the cars were run in a series of tests at various rates of speed. Each test was run at a predetermined speed which was maintained.

NEVER before such facts about motor oil. Here is proof that Polarine does an outstanding job of lubrication.

Think of these cars being whipped through more than a year's average mileage in 24 days. Consider the task Iso=Vis and Polarine were obliged to perform in providing constant effective lubrication at a maintained speed of 55 miles per hour for one thousand miles. And note the splendid manner in which these motor oils met the tests.

The Motor Coach Operator who uses Polarine Motor Oil is assured of positive thorough lubrication. He has unrefutable evidence of just what efficient lubrication Polarine will give. And Polarine has many times demonstrated its great lubricating qualities in motor coaches throughout the middle west.

Test Polarine in one of your motor coaches, check the performance and cost.

We will gladly submit further proof that it is to your advantage to use Polarine Motor Oil.

For best performance
from your
motor coach motors
use Polarine with
Red Crown Gasoline.

STANDARD OIL COMPANY
(Indiana)
910 South Michigan Avenue Chicago, Illinois 1206-

WITH RED CROWN GASOLINE

These Timken Advantages Will Increase Your Car-Day Profits

Tapered Roller
TIMKEN BEARING
EQUIPPED

The advantages of Timken Tapered Roller Bearings in electric railway cars may be classified under four main heads—Efficiency, Protection, Comfort, Economy.

Timken Bearing *efficiency* means that anti-friction requirements are met 100%; that starting resistance is reduced 88%; and that lubrication is negligible.

Timken Bearing *protection* means that hot boxes are eliminated; and that radial, thrust and combined loads are carried with a wide margin of safety under all operating conditions.

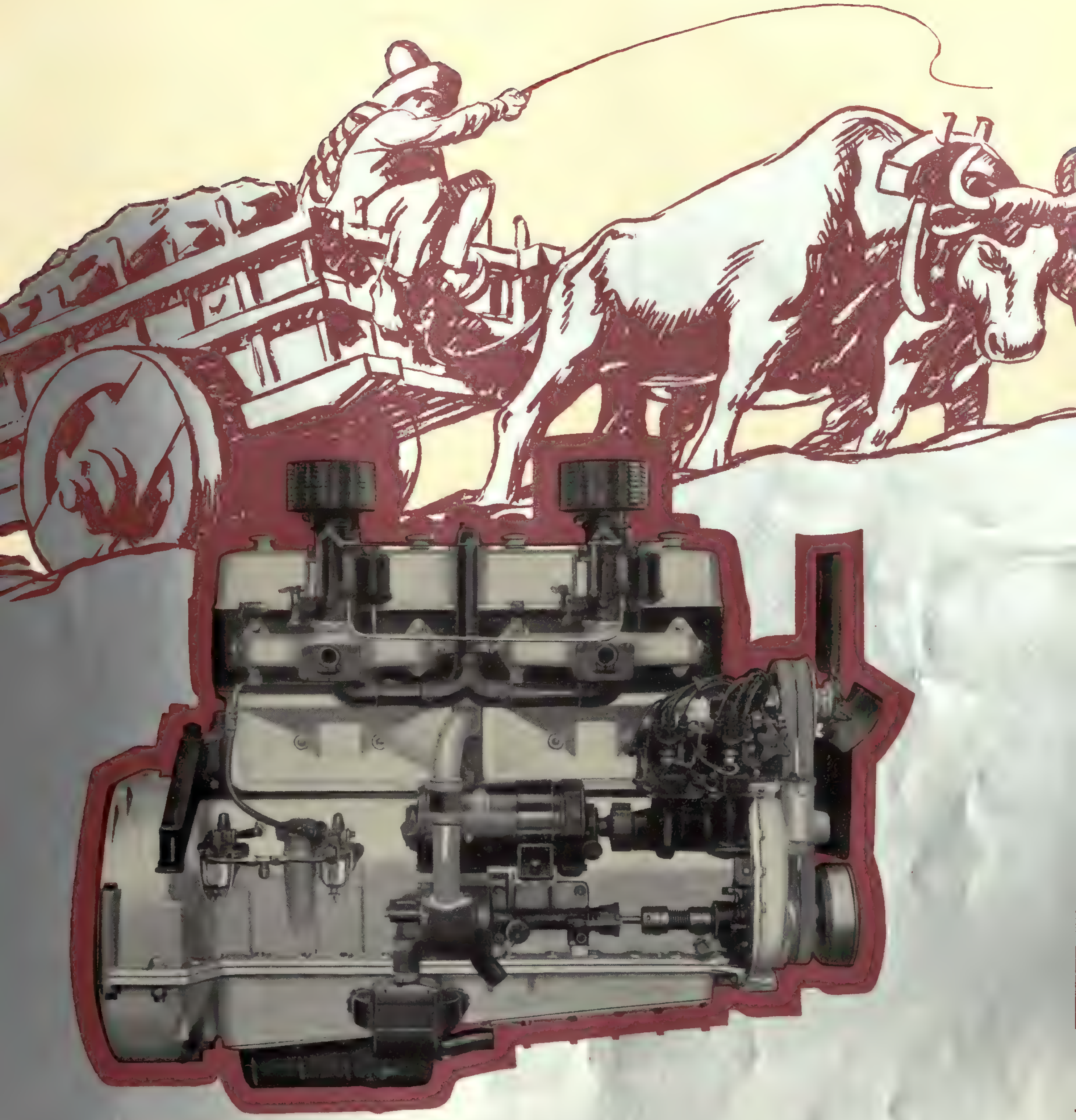
Timken Bearing *comfort* means smooth, steady, quiet running; freedom from jolts and jars; minimized side-sway.

Timken Bearing *economy* means that power is conserved; that lubricant is saved; that maintenance attention is reduced; that wheel life is lengthened; and that maintenance costs knock the bottom out of former lowest levels.

It's all in the exclusive combination of Timken tapered construction, Timken positively aligned rolls, Timken-made steel and Timken precision of manufacture.

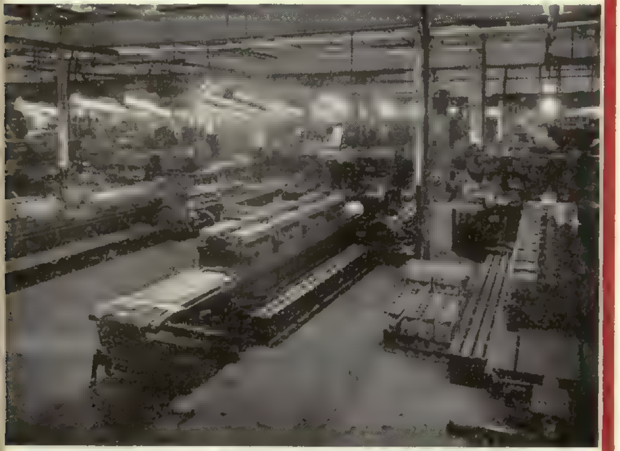
With Timken benefits in your favor you can meet every modern operating requirement and make more money. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**



The last word in POWER ...
Dependable • Economical • Quiet
as used in **Yellow Coaches ...**

One of the many special purpose machines employed—milling the top and bottom surfaces of the crankcase in one operation.



A row of specially developed milling machines. Left, crankcase milling. Center, head milling. Right, cylinder block milling.

Careful consideration has been given to proper lighting, ventilation and layout to insure ideal working conditions.

The plant is completely equipped with all modern labor-saving and material handling devices. Work in process progresses directly and automatically from one production or assembly line to the next.

»» Motor Coach performance and satisfaction centers in the power plant.

The General Motors Truck Company has developed engines of extraordinarily advanced design, assuring effortless, economical and sure performance of Yellow Coaches.

The paramount importance of the power plant has resulted in centering the production of its motor coach engines in its own plant at Pontiac—a plant unequalled in machine equipment and methods for both *quality* and quantity production.

These engines are produced in a separate plant, a large factory in itself—144,000 square feet equivalent to 200 feet in width by 720 feet in length. The one aim of this plant is production of good engines—*the best engines.*

Over four million dollars are invested in the engine plant and its machinery, special tools, dies, patterns, gauges and test equipment to accomplish the production of the best engines possible.

In this great specialized engine plant, production flows smoothly. Major inspections check every operation for accuracy and quality. Testing at frequent intervals assures correct manufacture.

Men, methods and equipment are all keyed to the higher standards imposed by the severe requirements of revenue transport service.

Reciprocating parts are balanced and checked to infinitesimal sensitivity, on machines specially developed in General Motors laboratories.

Engines undergo a thorough block test, are then torn down and inspected. Parts must show evidence of perfect functioning before reassembly and re-test for final inspection.

This care is the operator's protection against road failures. Such failures measured in terms of thousands of miles are ordinary—but when hundreds of thousands of miles between failures are produced, the fact becomes truly exceptional.

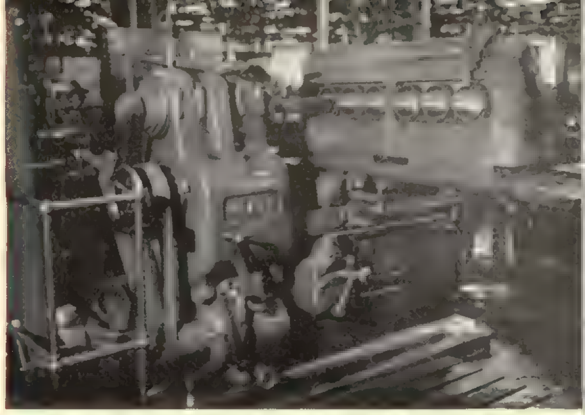
Not one, but thousands of Yellow Coaches powered with Yellow engines, are regularly producing such records.

Forty 33-passenger Yellows, equipped with "616" engines, recently completed 2 million miles in seven months with 5 road failures, all minor items.

Again, five similar coaches made 300,000 miles, averaging 325 miles per coach per day, with but 3 road failures.

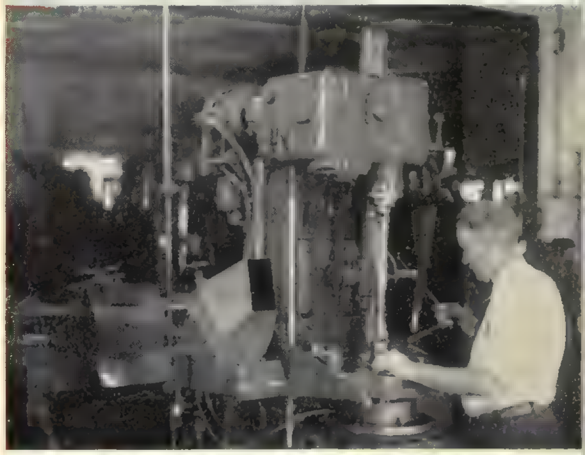
More recently, eight type "250" coaches operated 500,000 miles in six months, or 359 miles per coach per day, with but 3 road failures.

These are regular performance results of stock engines, in cross country service, where all failures chargeable to either bodies or chasses were included.



After careful testing, cylinder blocks are bored, groun and lapped to size. Maximum allowable limits are one-thousandth of an inch.

Every production line ends at a major inspection bench, where the work is rigidly checked for accuracy and finish.



One of the many special testing and balancing machines employed. This machine is for balancing flywheels.

YELLOW COACHES

Basically Similar

but of different h.p. range

The first of the new group of overhead valve engines of advanced design developed for use in Yellow Coaches was the now famous 150 H.P. type "616."

The unusual performance characteristics of this engine received almost instant recognition—passenger car acceleration, high torque at low engine speed, unusual hill climbing ability, complete absence of vibration, overheating and irritating valve noises, and surprisingly small fuel consumption for so powerful an engine.

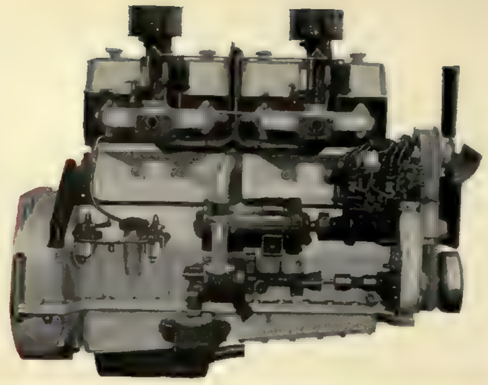
Its design included many new features; zero-lash automatic valve adjuster, down draft carburetion, harmonic balancer, oil cooler, and easy accessibility to all engine accessories.

The performance records which have been established with this engine since its introduction, both in cross country and city service, for low maintenance, long life, economy, dependability and freedom from failure have demonstrated beyond all possible doubt its truly extraordinary value for highway transport service.

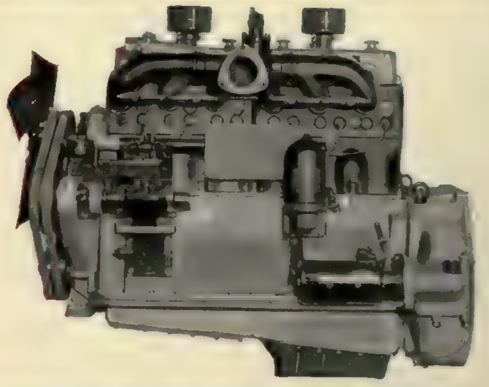
Three new engines of basically similar design but of smaller cubic inch displacement and H.P. range have now been developed to meet the specialized requirements of each class of transportation service. Within their power ranges each of these engines have almost identical performance, torque and power curve characteristics. All are of the same basic design, with many parts interchangeable.

A comparison of the four engines follows:—

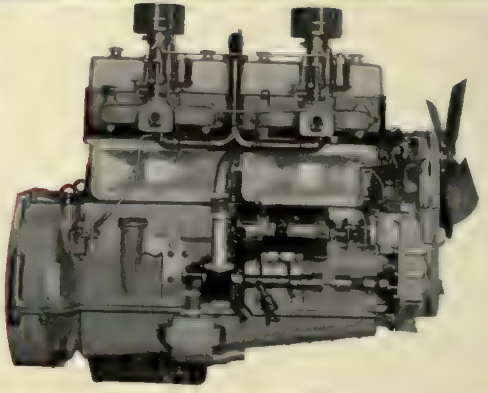
Engine Type	331	468	525	616
Bore and Stroke—Inches	3¾x5	4¼x5½	4½x5½	4⅞x5½
Displacement—Cu. Inches	331.4	468	525	616
N.A.C.C. Rating H.P.	33.8	43.4	48.6	57.0
Maximum Horse-Power	87	115	130	150
at R.P.M.	2800	2300	2300	2300
Maximum Torque—Ft. Lbs.	230	340	380	450
at R.P.M.	800-1400	1000	1000	1000



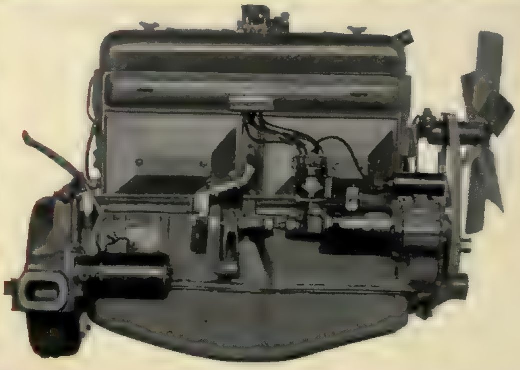
The 150 H.P. Type "616" Engine



The 130 H.P. Type "525" Engine



The 115 H.P. Type "468" Engine

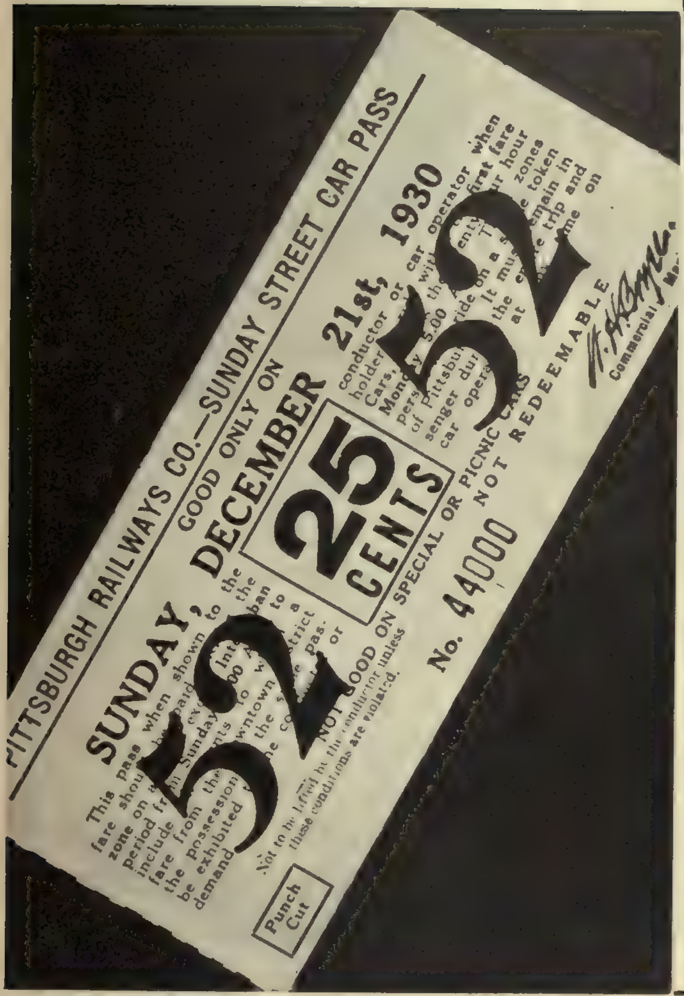


The 87 H.P. Type "331" Engine

GENERAL MOTORS TRUCK CO., *Pontiac, Michigan*

Subsidiary of Yellow Truck & Coach Mfg. Co.

AN ADDITIONAL INCENTIVE TO WEEK-END PASSENGERS



PITTSBURGH RAILWAYS CO.—SUNDAY STREET CAR PASS
GOOD ONLY ON
SUNDAY, DECEMBER 21st, 1930
25 CENTS
52
52
NOT GOOD ON SPECIAL OR PICNIC CARS
NOT REDEEMABLE
No. 44000
Punch Cut

. . . SELL THEM WEEKLY AND SUNDAY PASSES

The revenue-increasing ability of Weekly and Sunday Passes is being proved right now on many properties.

One case brought out the seemingly remarkable fact that off-peak riding due to the new weekly-pass had increased over 400%.

On the same property, Sunday Passes increased Sunday riding 600%!

Actually there is nothing amazing about it. It is simply the result of two "complexes" of the riding public—the bargain instinct and the urge to make use of "left-overs." In other words a person with a weekly pass having a few rides left will let his family use the pass or will himself use it up on the last few days during off-peak hours. The Sunday pass, in connection with judicious timely car card suggestions, will increase Sunday riding for the same reason.

Let us give you complete details.

GLOBE

TICKET COMPANY

PHILADELPHIA

Factories:
Philadelphia Los Angeles Boston New York Atlanta
Sales Offices:
Cincinnati Pittsburgh Baltimore Cleveland
St. Louis Des Moines

IN THE CRUCIBLES OF SCIENCE

Alloy production at Illinois Steel Company is a matter of infinite care, of precision standards from which no deviation is countenanced. Through the entire production process, the metallurgist watches, guides, and controls that the quality of Illinois Alloy Steel may always be uniform.

US STEEL

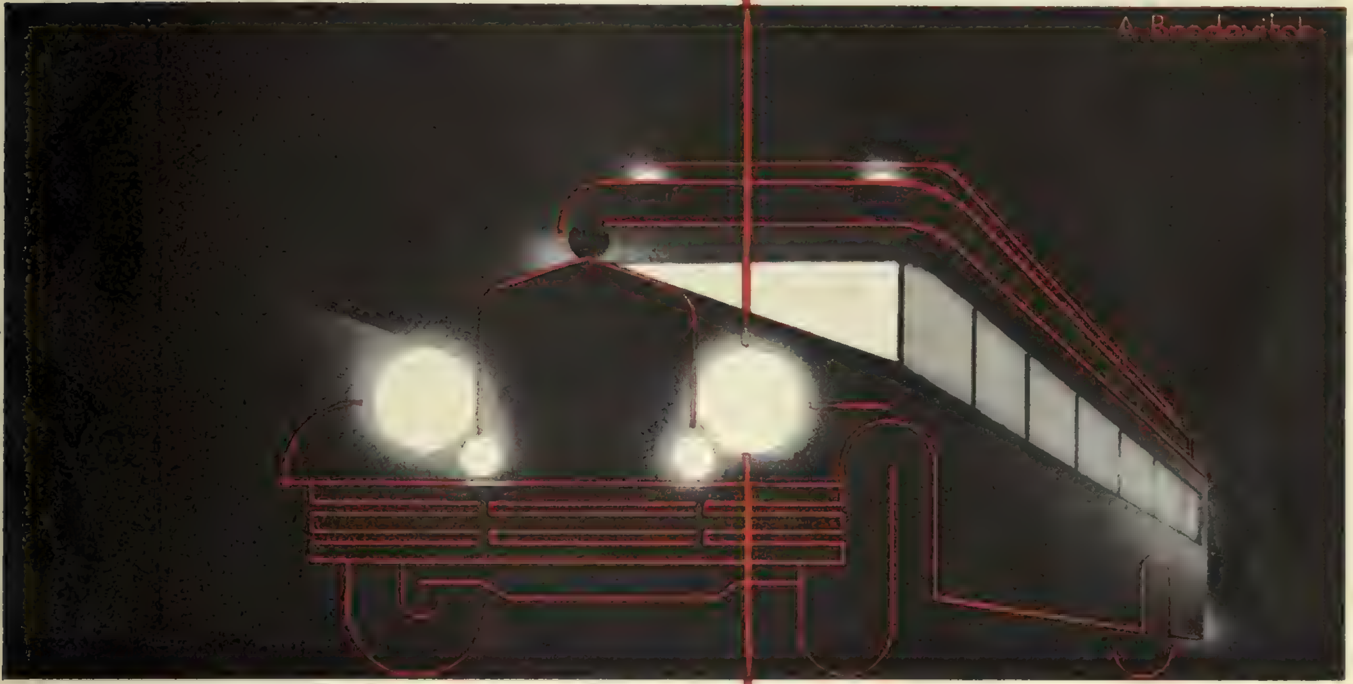
Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Ill.

ILLINOIS *alloy* STEEL

KEEP BUS LIGHTS BURNING BRIGHTLY WITH EXIDES



STEADY LIGHTS MAKE FOR STEADY PATRONAGE

•

Exide-equipped buses assure patrons of bright, steady lights at all times. These powerful batteries also provide current for strong running lights and dependable starting and ignition.

"Especially built for tough bus service" is why Exides are so dependable, have such a long life, are economical to operate. It's also why most of the leading motor coach manufacturers have made Exides standard equipment. Why don't you standardize on Exides, too?

If you want to know more about Exide Motor Coach Batteries, write us. No obligation.

For bright, steady lights —this rugged Exide Motor Coach Battery. Note the tough composition container that will not splinter or rot from exposure to weather, or acid.

Exide
MOTOR COACH
BATTERIES

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Insulate with Empire Tape for positive protection

GREAT dielectric and mechanical strength are combined in this varnished cambric tape. It's seamless, bias cut and made in long continuous lengths. For wrapping cable joints, coils and other conductors, manufacturers and repairmen have found it an ideal tape.

It's one of the some hundred electrical insulations with which the Mica Insulator Company fills the needs of industry. One characteristic is common to all these insulations—a uniform, unsurpassed quality—which is the result of more than 37 years of specialization.

The Mica Insulator Company provides an electrical insulation for every purpose. Catalog 87 gives the characteristics and suggested uses, in detail. Send for a copy.

MICA INSULATOR COMPANY

New York: 200 Varick St.; Chicago: 542 So. Dearborn St.; Cleveland, Pittsburgh, Cincinnati, San Francisco, Seattle, Birmingham, Los Angeles, Montreal and Toronto, Canada. Works: Schenectady, N. Y.; London, England.

MICA INSULATOR COMPANY

Electrical Insulations

LAMICOID — MICANITE — EMPIRE — MICO

A COMPLETE LINE FOR EVERY PURPOSE

Let . the public be . . pleased

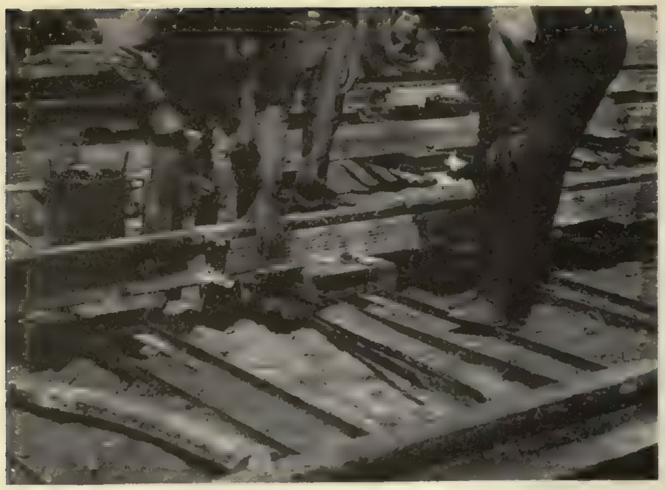
Let . operating *and* maintenance
costs go . . down

Let . the axles . . . . be

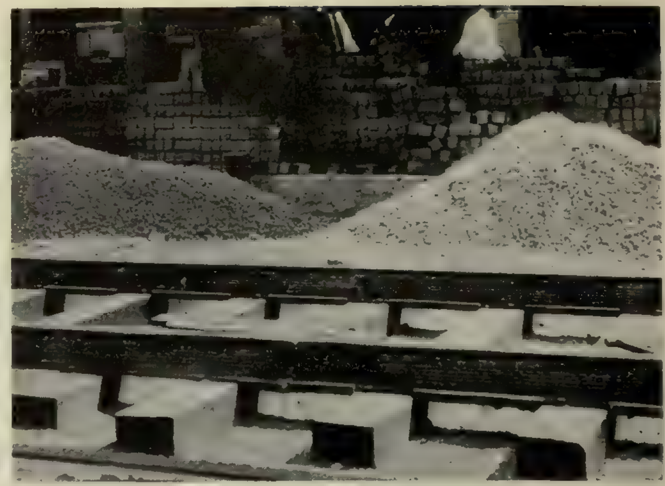
TIMKEN

FRONT *and* WORM DRIVE REAR

THE TIMKEN DETROIT AXLE COMPANY · · DETROIT · MICHIGAN



MECHANICAL TIE *or*



WOOD TIE

Carey Elastite RAIL FILLER

TRADE MARK REG'D U.S. PATENT OFFICE

Protects Paving next to Tracks

The deterioration of paving next to tracks is primarily caused by rail vibration. Carey Elastite Rail Filler, placed in the web of the rail as shown by the above photographs, provides a resilient cushion against vibration which would otherwise be transmitted to the adjacent paving. Paving "kick-ups" are thus prevented, with a consequent reduction of paving maintenance expense.

Elastite Rail Filler is an asphalt compound reinforced with tough fibres. Resistant to moisture and unaffected by climatic extremes of temperature, it requires no attention after its installation. The labor cost of its application is reduced to the minimum because the material is preformed to fit any type rail.

The value of Carey Elastite Rail Filler has been proven by installations in every part of the United States. We will gladly supply samples, prices and full information on request.

THE PHILIP CAREY COMPANY -:- Lockland, Cincinnati, Ohio

Branches in Principal Cities

BUILT-UP ROOFS ASPHALT PRODUCTS ELASTITE EXPANSION JOINT WATERPROOFINGS ROOF PAINTS	Carey PRODUCTS EST. 1873	HEAT INSULATIONS ASBESTOS MATERIALS CAREYSTONE CORRUGATED SIDING ASFALTSLATE SHINGLES BUILDING PAPERS

Fills a Special Summer Need

KOOLMOTOR OIL

Cools as it lubricates

Lowers consumption at sustained high speeds

KEEP bus motors *cool* in summer to cut operating costs . . . to maintain schedules . . . to stop road failures . . . to protect passengers against delays and inconvenience.

KOOLMOTOR Oil—the *perfect* Pennsylvania motor oil—is ideal for heavy-duty, hot-running bus engines because it *cools* as it lubricates —*absorbs* searing heat and *carries it away* from hot friction surfaces and bearings and at the same time decreases oil consumption at sustained high speeds.

You will need your buses this summer — they will be in great demand for excursions, outings, picnics, etc. You cannot afford to have them idle—laid up for repairs —thus reducing your profits. Protect them—keep them at work earning profits with KOOLMOTOR — the oil that *does more than lubricate* —the oil that *cools* as it lubricates.

Our representative will gladly call and explain, in more detail, why KOOLMOTOR is your special need for summer operation.

CITIES SERVICE COMPANY
60 Wall Street -:- New York City

CITIES SERVICE OILS

ONCE - ALWAYS

Friday, 8 P. M., Eastern Daylight Time, WEAF and 37 Associated Stations on N.B.C. Coast-to-Coast Network—Cities Service Orchestra, Cavaliers and Jessica Dragonette.

Cities Service Oils and Gasolene

"STANDARD" STEEL

WE leave no stone unturned to assure the longer life, greater dependability and lower maintenance cost of locomotive and car wheels, tires and forgings made of "Standard" steel. We control in our own plant all the operations and processes of manufacture from raw material to the completed product. This includes the making of the steel, the cooling and solidification of the billet, the forging of the billet, and the reforging, heat treatment and final exact machining and testing. Only in this way can we be sure that all "Standard" parts are worthy of the name and the confidence they enjoy with their many eminent and satisfied users.

STANDARD PRODUCTS

- Steel Axles
- Steel Springs
- Armature Shafts
- Rolled Steel Wheels

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS: BURNHAM, PENNA.

CHICAGO
NEW YORK
PHILADELPHIA

ST. LOUIS
RICHMOND

AKRON
PORTLAND
SAN FRANCISCO

COLLIER SERVICE

Car Cards as an advertising medium are working continuously to stimulate business activity. By working to increase trade they have helped to maintain electric railway traffic. They are a medium of traffic promotion.

Added to this they have been a dependable source of income to the operating companies for decades.

BARRON G.
COLLIER
INC.

NEW · YORK · CITY

The Blunt Truth about A Certain Gasoline

NEARLY two years ago, the Standard Oil Company of New York introduced Socony Special plus Ethyl—the *first* of all the oil companies serving the bus industry of New York and New England to add Ethyl to a premium fuel.

Socony engineers have not been content with their achievements of two years ago. They have bettered and improved Socony Special plus Ethyl so that week by week, month by month, it outsells any other premium fuel in Soconyland.

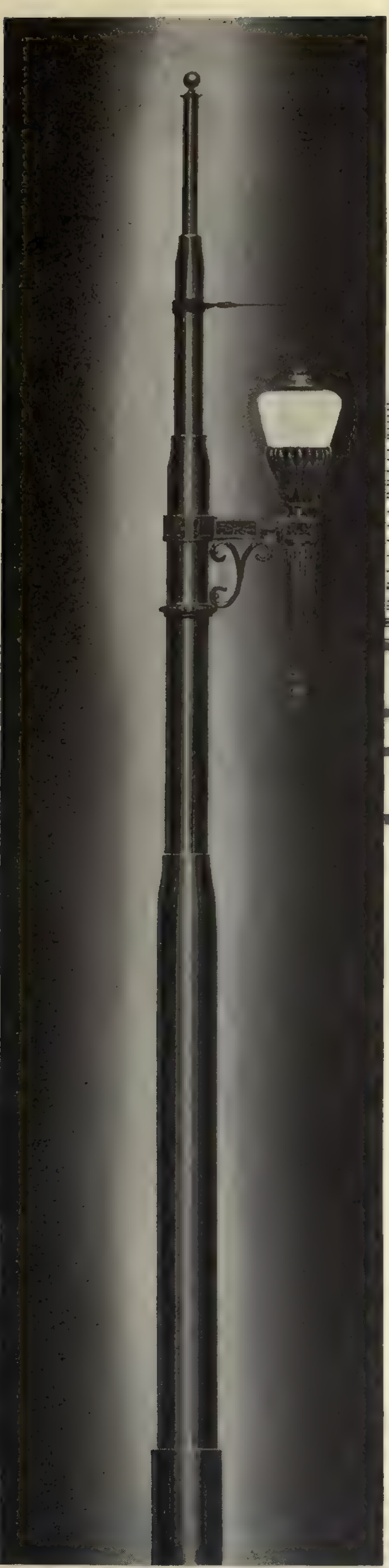
It is not remarkable that Socony should have this two-year margin of leadership. Socony engineers have always had one great and exclusive advantage. They are specialists in the conditions and needs of Soconyland. They know its roads, its temperature, its weather, its hills. Socony products are made for New Yorkers and New Englanders for use in New York and New England.

That is why we say that Socony products are "tailor-made" for Soconyland. That is why, everywhere in New York and New England, SOCONY is "Standard."

If you want—and you undoubtedly *do* want—a gasoline two years ahead in antiknock performance, in quick starting, in acceleration, in power, in mileage, in economy, try Socony Special plus Ethyl. It is specially made for you as a Soconyland bus operator.

SOCONY SPECIAL *plus* ETHYL

Tailor-made for Soconyland *Socony is "Standard"*



TO BEAUTIFY AND TO BE LASTING !

The graceful, tapering form which makes NATIONAL Tubular Poles an adornment to a city street, results also in a proportioning of weight and strength where both are needed most. Refinement of design has not led to weakness, but incorporates both beauty and durability.

The material used in NATIONAL Poles is a steel specially adapted for the conditions of line-pole service and proved by many years of use. The effect of strains and shocks of traffic, the fury of the elements and attacks of corrosion is reduced to a minimum by installing these strong, durable poles. Available in varying designs and dimensions. Beauty, safety, and economy are served by specifying them. Write for Bulletin 14, on poles made from—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

NATIONAL POLES

SELF ALIGNING BALL BEARING

DEEP GROOVE BALL BEARING

DOUBLE ROW DEEP GROOVE BALL BEARING

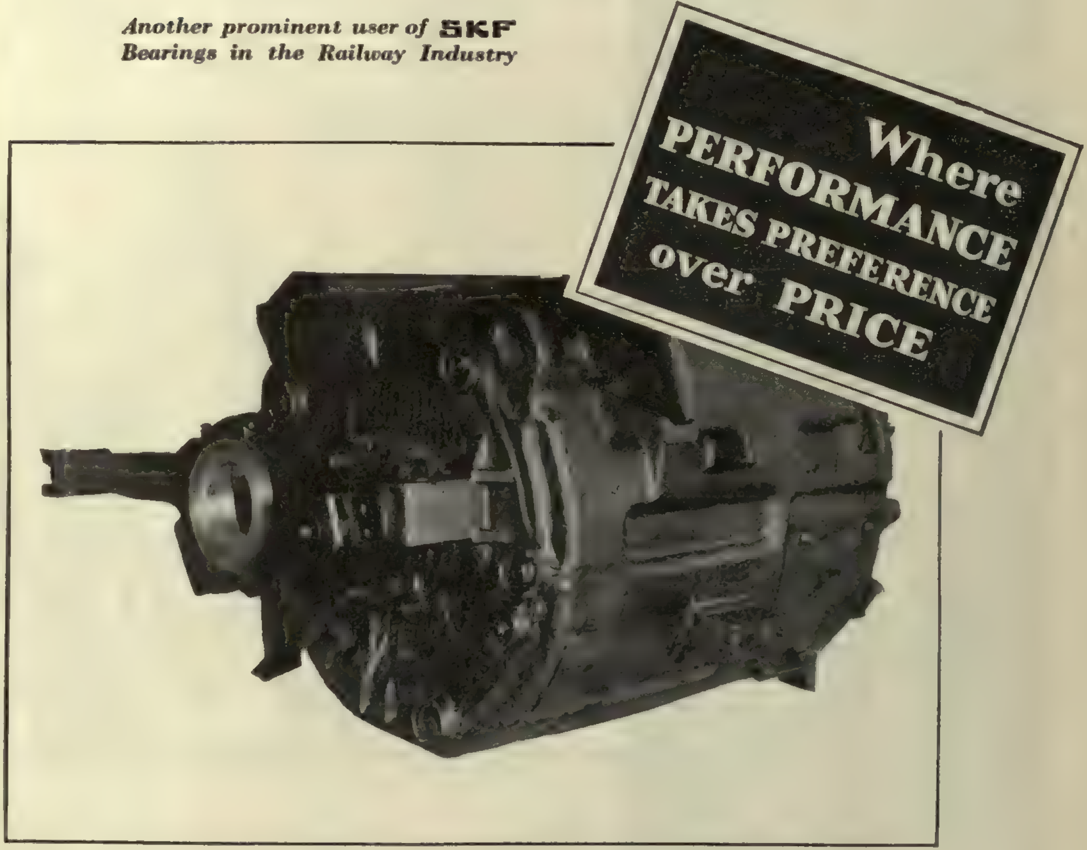
CYLINDRICAL ROLLER BEARING

SPHERICAL ROLLER BEARING

ALIGNING THRUST BEARING

WESTINGHOUSE ELEC. & MFG. CO.

Another prominent user of **SKF**
Bearings in the Railway Industry



SKF ON MOTORS FOR READING ELECTRIFICATION

ON 28 Westinghouse motors of multiple unit cars soon to be placed in service by the Philadelphia & Reading R. R. for its Philadelphia suburban electrification, SKF Roller Bearings are used for assured PERFORMANCE. Two 300 H. P. motors on each car . . . and two SKF's on each motor insure the dependability of high speed schedules.

Performance is the only thing that counts when the demands of the present day call for operation at the lowest cost per mile per passenger. SKF Bearings on these heavy duty motors meet every expectation of reliability, ruggedness and little maintenance through a long life under severe service conditions . . . with marked economy.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2726

SKF

ALBERT D. LASKER

Chairman of the Board, **Lord & Thomas and Logan**

● "For the past thirty-two years I have been in the advertising business. During the first sixteen years there was no Audit Bureau of Circulations and no assurance that the advertiser was getting value received in circulation. During the last sixteen years the Audit Bureau has functioned with increasing effectiveness. That its work is of first importance in the mind of the advertiser is evidenced by the vast sums invested in publications audited by it."

Albert D. Lasker

● By its own bootstraps advertising lifted itself into the confidence of business. And the leaders who helped in the process were the same men who worked the hardest for audited circulations of advertising media. It was through their efforts that the A. B. C. was founded.

To take the guess work and money wastes out of media selection, was and is today the sole purpose of the Audit Bureau of Circulations. Advertisers, agencies and publishers have joined in its support.

Through an independent, highly organized traveling staff it now audits annually the circulation records of almost every important publication in America. It publishes the full facts in terse, standardized form.

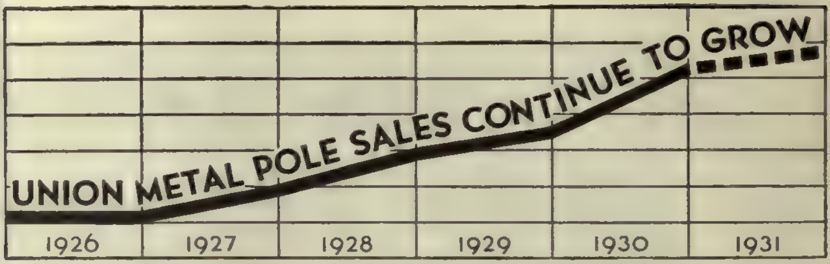
Careful advertisers and seasoned agency men use these printed A. B. C. reports as a safeguard to advertising expenditures. Through A. B. C. information, they win more readers per dollar, better distribution of the advertising audience, more intensity of reader interest. Such are the details by which markets are profitably won.

What is the cost of Bureau reports? Purely nominal! Any advertiser may have them always at his finger tips, simply by joining the distinguished and growing group that now holds membership in the A. B. C. Write for complete facts about Bureau benefits.

An advertisement by the

AUDIT BUREAU OF CIRCULATIONS

Executive Offices • • • Chicago



AN INCREASE in sales every year, with 1931 headed in the same direction! That is the story of the acceptance of Union Metal Poles by utility officials and the general public.

Today you will find Union Metal Fluted Steel Poles installed in Los Angeles, Cleveland, New Orleans, Chicago, Vancouver, Detroit, Kansas City, Pittsburgh and dozens of smaller municipalities. Each installation is tailored to order, and constructed to give trouble-free service for many long years.

Because they are fabricated from heavy steel and then cold-rolled, these poles withstand heavy side strains. And because of their strength—and appearance—one set of poles may be used to support trolley span wires, street lighting units, traffic signals, and distribution and transmission lines. The result is true economy for the users of the poles and a decided improvement in street appearance.

●

THE UNION METAL MANUFACTURING CO.
GENERAL OFFICES AND FACTORY • CANTON, OHIO

SALES OFFICES • New York • Chicago • Boston
Los Angeles • San Francisco • Seattle • Dallas • Atlanta

DISTRIBUTORS: General Electric Merchandise Distributors
Graybar Electric Company, Incorporated
• Offices in all principal cities •

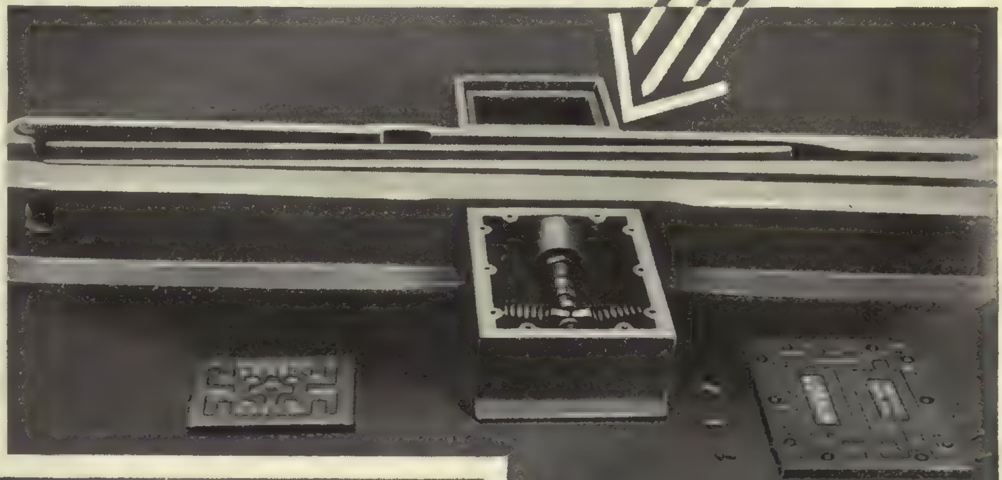
See our exhibit at the N. E. L. A. Convention at Atlantic City (Space 178-180).

UNION METAL
DISTRIBUTION POLES

Here is protection for

Tongue Mechanism~

LEHECKA WATER-TIGHT TONGUE HOLDING DEVICE



ANOTHER development of LORAIN is this device which can be set to hold the tongue securely in either position or for spring switch movement. The water-tight box in which the mechanism works is kept full of oil, an important feature as it reduces the wear on mechanism parts which are kept lubricated. Foreign matter, such as sand, dust, etc., is also excluded. Drainage of the switch-bed is provided for by the small box on the opposite side.

THE LORAIN STEEL COMPANY

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Sales Offices: Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

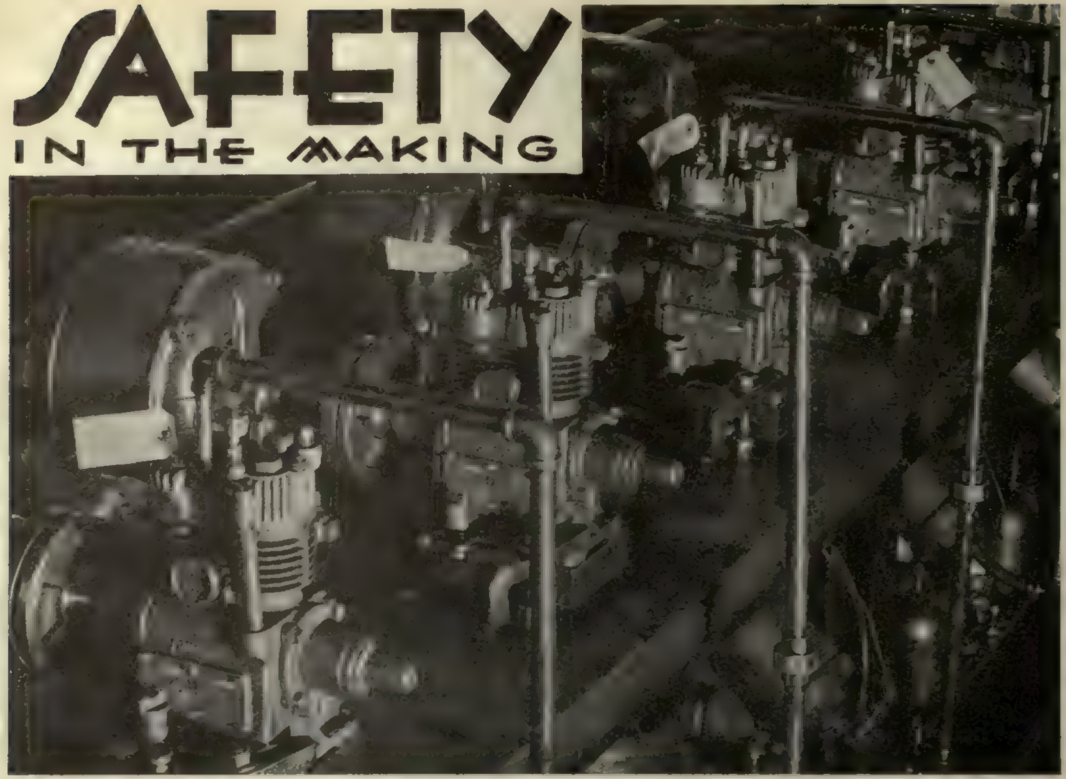
Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.

Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.

Ask the nearest Lorain Sales Office for Quotation

LORAIN

SAFETY
IN THE MAKING



From the drawing board to its final mounting on the chassis, the Bendix-Westinghouse compressor is ever a source of pride to those responsible for its development and manufacture ★ This sturdy unit, the heart of the Air Brake, is designed to more than meet the most rigid requirements of actual service ★ Each step in its production is constantly guarded with the same precise care you would expect of the watchmaker ★ Inspections . . . no end, and an actual operating test round out its program ★ How well the Bendix-Westinghouse Compressor merits the extreme care which attends its manufacture is best written in its years of never-failing service as a part of the braking system which safeguards the world's most prominent, heavy duty highway transport vehicles ★ Should you desire more specific information regarding the history making dependability of this remarkable unit, merely address the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6289

BENDIX
WESTINGHOUSE
AUTOMOTIVE AIR BRAKES

Which will she ride? . .
a lot depends on the seat
KARPEN
It's the Seating that Counts

IT'S the seating that counts, ...and there are three counts by which you judge good seating,...comfort, beauty and enduring service. Sit in a Karpen Seat and you have the story of its comfort...look at it and you know its eye value. And then check the third vital factor, *durability*, by asking transportation executives about Karpen's thirty-six year record of successful seat building, covering millions of miles of low-cost seat service.

S. KARPEN & BROS.

Transportation Seating Dept., Chicago

New York   Michigan City, Ind.   Los Angeles

No. 318

No. 17

No. 10

No. 100

KARPEN
Guaranteed
FURNITURE

KARPEN

It's the Seating that Counts

"ASK R B & W—THEY KNOW"

BOURKE-WHITE PHOTO

●

complete information on bolting material from our Engineering Service

●

"WHAT should be the physical characteristics and the allowable working stresses of the bolts used in our product?" Requests such as that come to R B & W from manufacturers all over the world. Users of bolting material have come to know that, no matter what technical or scientific questions they have, they can get the information from R B & W.

In a recent request for counsel, a maker of forgings used on pressure vessels stated he had sought advice from three other sources that might be expected to know the answers to his questions, but they went unanswered until he wrote R B & W.

Foreign users of bolting material, acknowledging the superiority of the American product as made by R B & W, frequently visit or write us for guidance.

Write to headquarters for bolting material information when you need assistance in planning or redesigning your bolts—make use of the vast fund of information collected by the R B & W Engineering Service from actual experience in all branches of world industry.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

ROCK FALLS, ILL. PORT CHESTER, N. Y. CORAOPOLIS, PA.

Sales offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

BY THIS SIGN YOU WILL KNOW THEM

JACKSON LUMBER COMPANY
POLES
DIXIE
PILING
LOCKHART, ALABAMA

TRADE MARK

SYMBOL OF A COMPLETELY OWNED OPERATION FROM TREE TO LOADED CAR

This Warranty Mark signifies Dense Long Leaf Yellow Pine, correctly seasoned and uniformly graded, and it is branded on every piece of Jackson stock.

Selling Agents

ROBERT W. FORBES
Room 2845
Grand Central Terminal
New York City

F. B. MERRITT
Room 1560
First National Bank Bldg.
Detroit, Mich.

JACKSON LUMBER CO.

Manufacturers

Lockhart, Alabama

A CROSSETT WATZEK GATES INDUSTRY

Trolley Retrievers for the Trolley Bus

We have recently completed a new series of Earll Retrievers for the new Trolley Buses. The same simple construction and sturdy action is used as in our universally-used trolley types.

They draw the pole down below the danger zone at the first jump. They are non-binding, sure in action, and require practically no maintenance other than a few drops of oil per month.

Chicago Surface Lines use Earll trolley bus retrievers.

Avoid damage to overhead—install Earll Trolley Retrievers. *Send for details.*

Made by

C. I. EARLL, York, Pa.

CANADIAN AGENTS:
Railway & Power Engineering Corp., Toronto, Ont.
IN ALL OTHER FOREIGN COUNTRIES:
International General Electric Co., Schenectady, N. Y.

News ★ ★ ★ ★

brief, late news flashes for the *electric railway industry*

!

To supplement the service of the regular monthly issues of *Electric Railway Journal*, a separate NEWS service appears on thirty-nine Saturdays during the year. This supplement keeps you in touch with court decisions . . . fare increases . . . new ordinances . . . association meetings . . . financial announcements . . . equipment purchases.

Subscription Price: For all countries taking domestic subscription rate, $2 per year. Combination with the monthly edition of *Electric Railway Journal* for $5 a year domestic rate.

ELECTRIC RAILWAY JOURNAL
475 TENTH AVE.
NEW YORK CITY

Enter my subscription to the Electric Railway Journal *News*. Bill me for $2.

Name ....

Address ....

City ....State ....

Plain bolted frog which had been worn out; and quickly reclaimed by welding with TIMANG.

Same frog after being welded with TIMANG Manganese Welding Rod in the track.

WELD MANGANESE TRACKWORK WITH

TISCO
TIMANG
(AIR TOUGHENING)
Welding Rod

MANGANESE track welds made with TIMANG (air toughening) Welding Rod have practically the same hardness—the same resistance to wear—as the parent metal. Moreover, TIMANG welds are ductile, and will not crack in service.

If you are anxious to lower track maintenance, investigate TIMANG today. Communicate with the nearest TISCO office, or write to High Bridge for TIMANG bulletins.

"TIMANG" Trade Mark is registered in United States and foreign countries. "TIMANG" Steel is protected by U. S. Patent 1,782,202 and foreign patents. Other patents pending.

Taylor-Wharton Iron and Steel Co.
HIGH BRIDGE, NEW JERSEY

SALES OFFICES: Chicago Houston Montreal New York Philadelphia Boston San Francisco Scranton Tampa Los Angeles

Trolley Shoes are making history—

When maintenance men get together these days you hear trolley shoe history in the making . . . and the majority of the boys say the greatest contribution toward satisfactory results has been

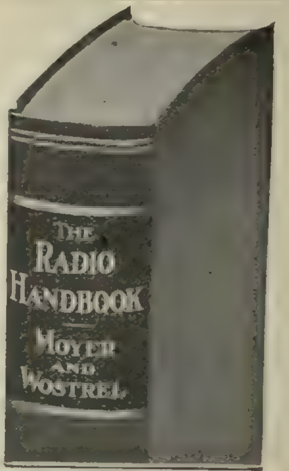
·IONLOYD·

Reversible Trolley Shoes

Let's talk it over

Efficiency Products Corp.
1203 Barlum Tower, Detroit, Mich.

Just published! The most important radio book of the year



The RADIO HANDBOOK

Including Television and Sound Motion Pictures

by JAMES A. MOYER *and* JOHN F. WOSTREL

Both of the Massachusetts Department of Education; Authors of *Radio Receiving Tubes, Practical Radio Construction and Repairing,* etc.

886 pages, 5½ x 8, 650 illustrations, flexible, $5.00

Over 875 pages of latest data on:

- —modern transmitters, Piezo crystal, 100% modulation, etc.
- —commercial and amateur short wave receivers and transmitters, Kennelly-Heaviside layer, etc.
- —marine radio equipment, auto alarm, etc.
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a complete, modern manual of practical and technical radio information

HERE at last is a handbook that meets the need for a complete digest of authoritative radio data, both theoretical and practical, in one logically arranged and thoroughly indexed volume. From the fundamentals of electricity, magnetism and electron theory right down to full details on latest commercial and industrial applications, this book covers the whole field of radio, with descriptions, definitions, design data, practical methods, tables and illustrations in profusion.

Space does not permit a full description of this book. However, we know this is the book for which you have been waiting. Therefore we make this offer: Send no money, just mail the coupon; examine the book thoroughly for ten days free; then pay for or return it according to its value to you. No other obligation. Send the coupon today.

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

You may send me a copy of *Moyer and Wostrel—Radio Handbook*, postpaid, for 10 days' free examination. At the end of that time I agree to remit the price of $5.00 or return the book postpaid.

Name ....

Home Address ....

City and State....................

Name of Company....................

Occupation ....

(Books sent on approval to retail purchasers in U. S. and Canada only.)

E. 6-31

Danger of breakage is minimized with the GUS-2 gas weld bond.

Conductor wires are firmly gripped by the heavy, all-copper terminals dampening cable vibrations. Bonding with the GUS-2 insures full conductivity—the weld with the rail can easily be made six times the conductor area. Notice the conductor extends through the terminal so that the cable ends are easily fused into the weld metal. Type G-1, the alloy rod used to apply these bonds, produces a sound, tough weld at low resistance.

Write for your copy of Circular No. 18. It describes this and other gas weld bonds in detail.

Takes the Shocks of High Speed Service

Electric Railway Improvement Co.

2070 East 61st Place, Cleveland, Ohio

FABRICATED STRUCTURAL STEEL

For all kinds of BRIDGES and BUILDINGS

AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

Manufacturers of

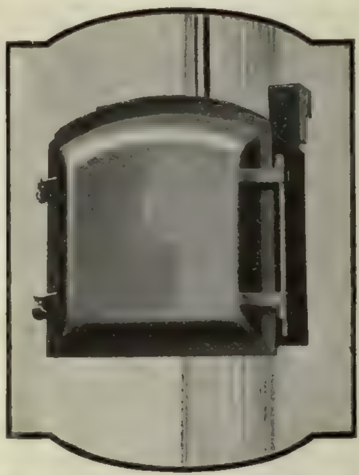
STEEL STRUCTURES

for every purpose

General Office: 71 BROADWAY, NEW YORK, N. Y.

Offices in principal cities

On Time



Schedules can be maintained with unfailing regularity when Nachod Headway Recorders automatically supervise the line. They tab, in print, the exact time that each car passes the points of installation, thus, giving you a daily report of all car movements. Simple in mechanism ... dependable ... durable. No adjusting ... just daily winding and change of record. Write for particulars and prices. Nachod & United States Signal Co., Inc., Louisville, Ky., Manufacturers of Block and Highway Crossing Signals.

"Nachod Spells Safety"

NACHOD *Headway* RECORDERS

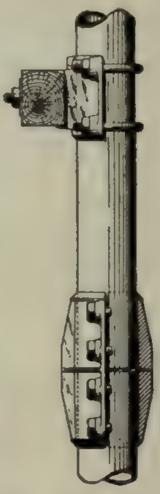
Strengthening Poles

Many tubular poles require strengthening after 20 to 30 years' service. Upper joints under ornamental collars, etc., and poles at ground-line have deteriorated to the danger point.

M. I. F. Reinforcing Clamps for all normal sizes of poles restore the original strength mechanically in the most simple and economical method available. The introduction of trolley buses may also render highly desirable similar reinforcement of existing poles.

M. I. F. Extension Clamps facilitate pole-top extensions required by street-widening, or provision for additional circuits, etc., using pipe of same size or nominally 1" smaller.

Pole Mounts for special jobs of anchoring poles on bridges, rock, concrete, etc.



"C" Clamp Extension incl. Gain.

Send for Sales Bulletin No. 3

Also Insulated Suspension Hangers for signal conductors, etc., and Pole Hardware Specialties for wood poles, including Guy Hooks, Crossarm Gains, Pole Mounts, Cable Suspension Clamps, etc.

MALLEABLE IRON FITTINGS COMPANY

Pole Hardware Dept. [Factory and New England Sales Office] Branford, Connecticut

New York Sales Office: Thirty Church Street

Canadian Mfg. Distributor:

LINE & CABLE ACCESSORIES, Ltd., Toronto

Durability

The Toledo Torch is built to last a long time. Rigidly built of steel throughout, it's unbreakable, leakproof and good for long, continuous service.

Order from your dealer—
insist on the genuine Toledo

Toledo Torch

USE THE TOLEDO TORCH NO OTHER SIGNAL MEANS SAFETY

The Toledo Pressed Steel Co.
TOLEDO OHIO

Save with Steel

Manufacturers of The Toledo Horse—the ideal highway barricade

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PANTASOTE

TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE

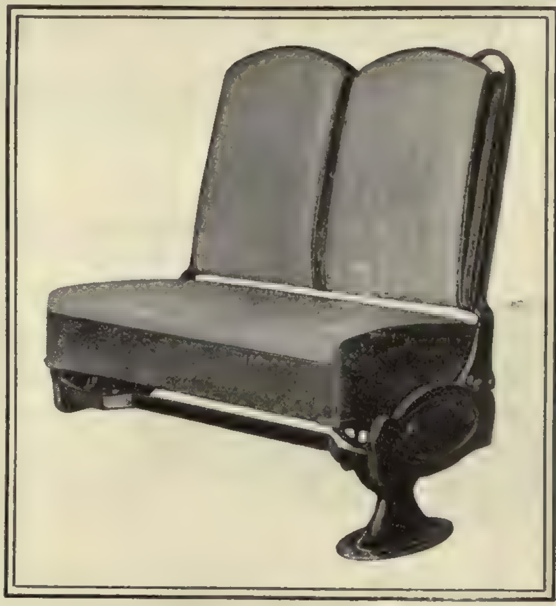
TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard
for electric railway cars
and motor buses

Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK



Attractive — Clean — Comfortable

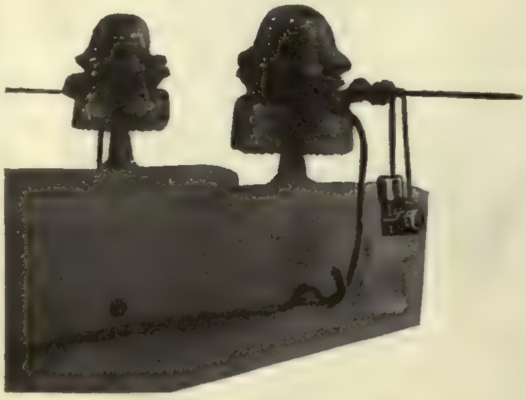
MAINTENANCE engineers will be quick to appreciate the advantages of this Heywood-Wakefield seat. The cane webbing backs and cushions offer a generous measure of comfort, yet they do not soil readily, are practically indestructible, and very easy to clean. The genuine leather facing on the cushion reinforces the seat at the point where strain is most apt to come and allows full bellows action. The individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the cushion and back frame of this 327 M is glued, and screwed. A note to any of the Heywood-Wakefield sales offices listed will bring complete details on this or any other of the popular and practical bus and electric railway seats in our line.

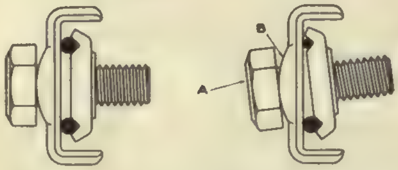
HEYWOOD-WAKEFIELD

Heywood-Wakefield Co., Boston, Chicago, New York; G. F. Cotter Supply Co., Houston, Texas; J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.; H. G. Cook, Hobart Bldg., San Francisco, Calif.; A. W. Arlin, Delta Bldg., Los Angeles, Calif.; Ry. & Power Eng. Corp., Montreal, Toronto, Winnipeg, Vancouver, Canada.

MODEL C WIRE CONNECTOR

FOR QUICK AND SECURE CONNECTIONS





Only 2 Sizes Required

Size No. 1
No. 2 to No. 14 Wire Inclusive.

Size No. 2
No. 14 to No. 20 Wire Inclusive.

Makes Testing Easy
No Solder
No Sleeves
No Cutting of Line Wires
Every Repair Gang Should Have These

SAMPLE OR BULLETIN NO. 9 SENT ON REQUEST

Patent No. 17828

LOUISVILLE FROG SWITCH & SIGNAL COMPANY
INCORPORATED
LOUISVILLE, KY.

For medium voltage — insulate with GLASS

BEST UP TO 15,000 VOLTS

Let us tell you why

Send for Catalog.

HEMINGRAY

HEMINGRAY GLASS COMPANY
General Offices and Factory Muncie, Indiana

The Electric Railway Field
at your finger-tips

Contents Include:

Names and addresses of the Electric Railway Companies in the United States, Canada and the West Indies, arranged geographically by Post Office address. Names and addresses of officials and principal department heads. Names of subsidiary bus companies. Location of repair shops and power plants. Mileage of the road. Gage of track. Number and kind of cars used. Number of buses operated. Number of garages and capacity. Rates of fare. Transmission and Trolley voltages. Capacity of substations. Index of electric railway company officials, giving company connections.

for $10.00!

McGraw-Hill Catalog and Directory Company, Inc.
477 Tenth Avenue at 36th Street, New York, N. Y.

F-ERJ

ALL ISN'T GOLD...

THE thought contained in that old saying "All is not gold that glitters" may well be applied to trolley wheels.

It takes the finest in materials and workmanship to produce Kalamazoo Trolley Wheels. They always provide ample conductivity and resist the wear caused by pounding against trolley ears.

Let us tell you why we have supplied continuously for over 25 years, many of the country's leading Electric Railways.

THE STAR BRASS WORKS

KALAMAZOO, MICHIGAN

KALAMAZOO

ELECTRIC CAR-HEATERS

THERMOSTATIC CONTROL

STEAM HEATERS FOR BUSES

COMPLETE PNEUMATIC DOOR AND STEP OPERATING EQUIPMENT

HIGH & LOW VOLTAGE BUZZERS & BELLS

SAFETY SWITCHES

SAFETY SWITCH PANELS

CONSOLIDATED CAR-HEATING CO., INC.

NEW YORK ALBANY CHICAGO

LEATHER?

Have You Our Latest Samples?

If not, write for them. Our new sample books contain all the latest upholstery leathers, *with revised prices.*

Attractive in color, grain and price—to meet every standard you require in upholstery leather.

America's Largest Producer

GENERAL LEATHER CO.
Newark, N. J.

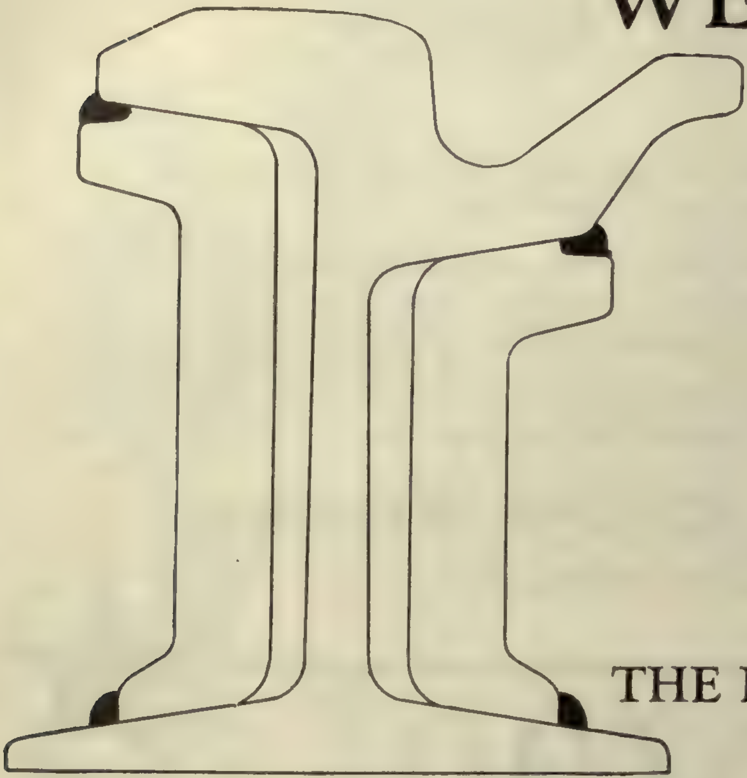
Makers of the Famous Tried and Proven "00" Leathers

Detroit Office:
General Leather Co.,
414 Fisher Bldg.

London Office:
R. & A. Kohnstamm, Ltd.,
21 West Smithfield,
London, E. C.

West Coast Office:
A. J. & J. B. Cook, Inc.,
237 Eighth St., San Francisco

Canadian Office:
Colonial Traders, Inc.,
277 William St., Chatham, Ont.



"WELD PLATES"

For EFFICIENT, ECONOMICAL

JOINTS

Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

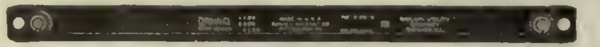
"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

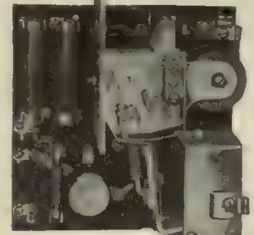
THE RAIL JOINT COMPANY
165 Broadway, New York

Utility Car Heaters fitted with

ENCLOSED HEATING elements carry the Underwriters' Laboratories Label. They give 100% energy output for what you put in.



CHROMALOX STRIP



NO. 10 REGULATOR

UTILITY HEAT REGULATORS economize in current consumption.

UTILITY HONEYCOMB VENTILATORS keep the air pure and wholesome.

RAILWAY UTILITY COMPANY
2241-47 Indiana Ave., Chicago
J. H. DENTON, *Eastern Mgr.*
1328 Broadway, New York

Car Comfort *with* *Utility Heaters Regulators Ventilators*

TUCOLITH FLEXOLITH

Long Wearing

Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

1. Long Life
2. Attractive
3. Non-Slip Surface
4. Fireproof
5. Sound Deadence
6. Sanitary

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
PEOPLES GAS BLDG.,
122 S. MICHIGAN AVE., CHICAGO

INVESTIGATE THE MANY ADVANTAGES

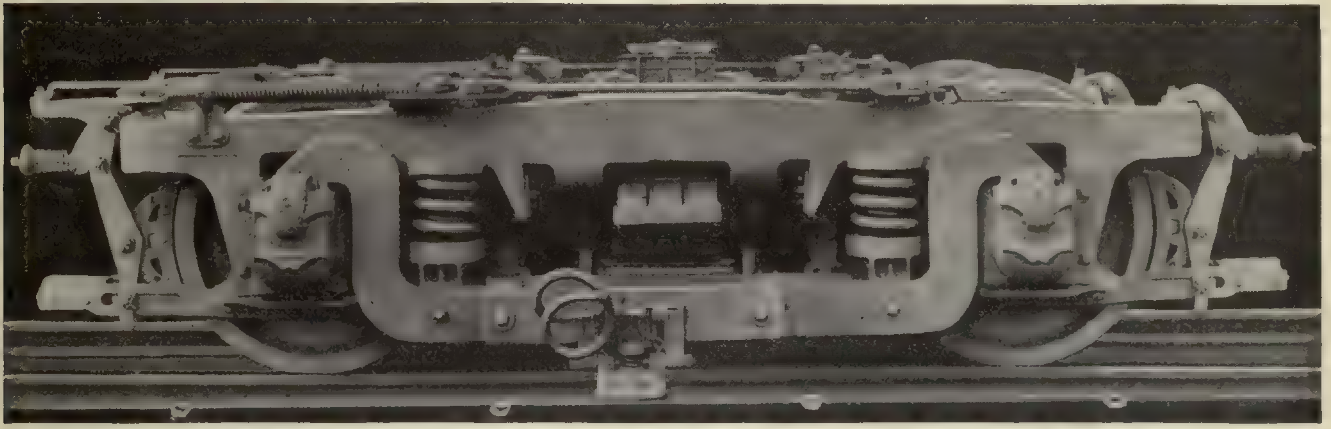
Commonwealth Trucks do a real job in any service because they are specially designed for modern operating conditions. For high speed, interurban, or city service they offer you many advantages. Learn about their features and how they will save money for you.

Cast steel frames, including cross and end transoms, a single strong unit.

Pedestals cast integral with frame. Removable hardened spring steel liners protect them from wear.

COMMONWEALTH TRUCKS

"SWING MOTION TYPE"

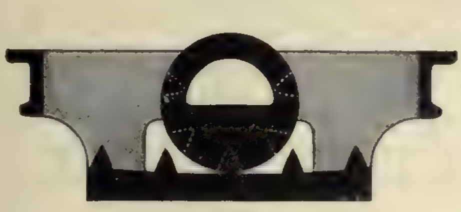


GENERAL STEEL CASTINGS CORPORATION

GRANITE CITY, ILL. *EDDYSTONE, PENNA.*

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED



LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.

Canadian Representative
The Holden Co., Ltd., Montreal, Canada

REAP LARGE PROFITS

INTERNATIONAL BUS REGISTERS

provide a positive fare checking system enabling you to turn more of your income into actual money in the bank.

Eliminates errors, disputes, losses

International Bus Registers can show you results as soon as you put them to work. When you standardize on them you have solved all previous fare checking disadvantages. Investigate the low first cost—the long life due to indestructible parts and other features that make Internationals the modern fare register.

Write for Complete Details

SENT ON 10 DAYS FREE Trial

The International Register Co.
17 South Throop St., Chicago

ENGINEERS *and* CONSULTANTS

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS

EXAMINATIONS
REPORTS-APPRAISALS-RATES
OPERATION-SERVICE

ALLIED ENGINEERS, Inc.

Engineers and Constructors

20 Pine Street
New York

Transportation Examinations and Reports

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Engineers and Accountants
JOHN A. BEELER, DIRECTOR
Traffic — Traction
Bus-Equipment
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Appraisals Operating and
Financial Reports
Current issue LATE NEWS and FACTS
free on request
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Consultant on Fares
and Motor Buses

The Weekly and Sunday Pass
Differential Fares—Ride Selling

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616 E. Lincoln Ave., Mt. Vernon, N. Y.

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NEW YORK
49 Wall Street

Phone: Hanover: 2142

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UTILITIES

Transit-Traffic Development Surveys. Street Plans, Controls, Speed Signals. Economic Operation, Schedule Analyses, Bus Co-ordination, Rerouting. Budgets, Valuation, Rate Cases and Ordinances.

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Washington, D. C.

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CHICAGO

TRANSIT DEVELOPMENT
OPERATING PROBLEMS
TRAFFIC SURVEYS
VALUATIONS

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CONSULTING ENGINEERS
Gardner F. Wells
Albert W. Hemphill

APPRAISALS

INVESTIGATIONS COVERING
Reorganization Management
Operation Construction

50 East 42nd St., New York City

BYLLESBY ENGINEERING *and* MANAGEMENT CORPORATION

BYLLESBY PIONEERS IN PUBLIC SERVICE

231 S. La Salle Street, Chicago
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SANDERSON & PORTER
ENGINEERS
for the
FINANCING—REORGANIZATION
—DESIGN—CONSTRUCTION
of
INDUSTRIALS and
PUBLIC UTILITIES

Chicago New York San Francisco

The P. Edward Wish Service

50 Church St., NEW YORK

Street Railway Inspection
DETECTIVES

131 State St., BOSTON

JULY ISSUE
Closes June 19th

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

ELECTRIC RAILWAY JOURNAL

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.00
2 to 3 inches .... 5.75 an inch
4 to 7 inches .... 5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. R.J.

COPY FOR NEW ADVERTISEMENTS ACCEPTED UNTIL 3 P. M. ON THE 20TH FOR THE ISSUE OUT THE FIRST OF THE FOLLOWING MONTH

DISMANTLING?

Let us handle this for you. We specialize in buying and dismantling entire railroads, street railways, industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.

Consult us also about New and Relaying Rails—all weights and sections. You will like our service.

The Perry, Buxton, Doane Company

(Capital $1,000,000.00)

Boston Office, P. O. Box 5253, Boston, Mass.

Pacific Sales Office—Failing Building, Portland, Oregon

POSITION WANTED

MASTER Mechanic, 20 years' service street and interurban cars and busses overhauling, and maintenance of equipment. Salary and location secondary. PW-247, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

BUSINESS OPPORTUNITIES

A BUSINESS opportunity advertisement placed in this column will be read by over 6,000 men actively engaged in the Electric Railway field. Place your advertisement here, if you need capital to finance a project? If you wish to buy or sell property pertaininw to the Railway industry. If you wish to finance some railway project, etc. You will find it pays to tell your story here. Send your advertisement to the Searchlight Dept., Tenth Ave. at 36th St. New York.

FREE BULLETIN

LIQUIDATION SALE — Equipment of United Fuel & Supply Company, steam operated locomotive crane, standard and broad gauge, portal pier type cranes, crawler cranes, buckets, loaders, bins and locomotive. 16-page illustrated booklet, giving complete description, available on request to Industrial Plants Corpn., Columbian Bldg., Columbus, Ohio.

TO HELP YOU

GET WHATEVER YOU NEED

"Searchlight" Advertising

FOR SALE

4—Single Truck, Double End, **Safety Passenger Cars**, 5 ft. gauge.
1—Single Track, right hand, Branchoff 82 lb., 505, 50 ft. radius.

Prices, details, pictures "etc." will be furnished upon request.

J. LESTER BUTLER, Purchasing Agent
City Hall, City of South Jacksonville, Fla.

Electric Locomotives

600 volt Electric Locomotives—specifications, photographs and price on request. Immediate delivery.

HYMAN-MICHAELS COMPANY
20 N. Wacker Drive Bldg., Chicago, Ill.

Saving is a good habit, BUT—
Why Save Things You'll Never Use?

WHY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department
ELECTRIC RAILWAY JOURNAL
Tenth Ave. at 36th St., New York, N. Y.

Rolling stock in the repair shop adds no profits

LET us help you speed up repairs and get cars and buses back into service more quickly because rolling stock in the repair shop adds no profits to the balance sheet.

Operators of surface lines and buses have discovered that one sure, certain way to lower maintenance costs is to use Oakite materials and methods. Exacting tests have proved that these modern materials clean quickly and effectively, and are safe to use and handle. In addition and equally important, is the fact that these materials are economical to use.

Take advantage of the practical and wide experience of Oakite Service Men and make it a part of your maintenance personnel. All users of Oakite materials are entitled to this service, without cost or expense. It is a service that has enabled many electric railway companies to save considerable money and improve their maintenance work.

Tell us your problems or ask for our Service Man in your locality to call.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG U S PAT OFF
Industrial Cleaning Materials and Methods

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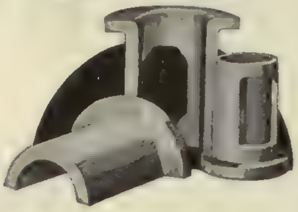
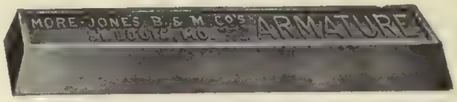
"More-Jones" Trolley Wheels and Harps

"Tiger" Bronze Axle and Armature Bearings



"Armature" Babbitt Metal



The "Vigne" Bimetallic Armature Bearing

◆ ◆ ◆

NATIONAL ELECTRIC RAILWAY SPECIALTIES

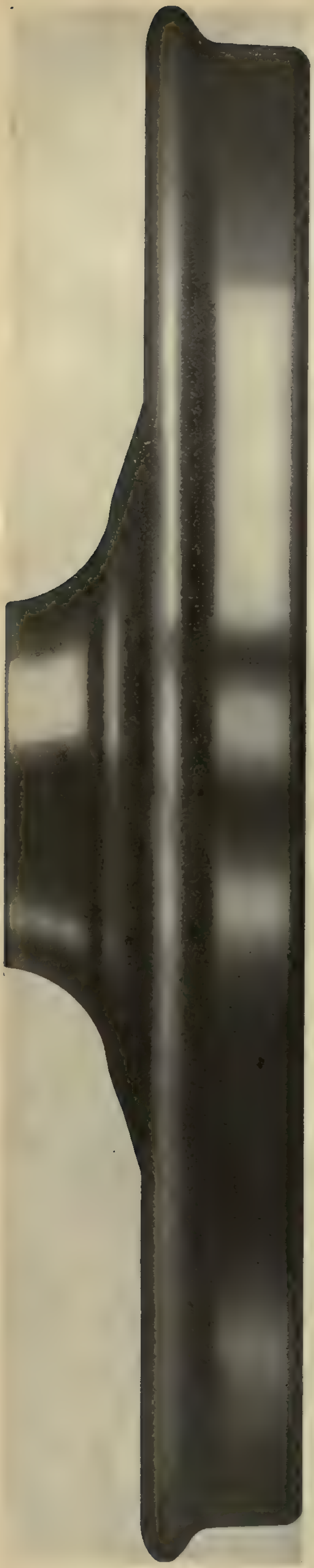
◆

Our specialties have been tested under all conditions. Therefore, they will admirably and economically meet your requirements. Also you are saved the trouble and costs of making frequent tests to attain satisfactory results. Take advantage of our experience.

NATIONAL
Bearing Metals
Corporation

ST. LOUIS, MO.

New York, N. Y. Meadville, Pa.
Jersey City, N. J. Portsmouth, Va.
Pittsburgh, Pa. St. Paul, Minn.



WHEELS

that are strong, safe and durable!

Wheels for electric railway cars must be good wheels. Only wheels made of the best steel by the most modern methods stand up under the severe operating conditions encountered today. That is why so many electric railway executives are turning to Bethlehem Wrought Steel Wheels.

Strength, endurance and wearing qualities are worked into Bethlehem Wrought Steel Wheels during the process of manufacture. Five distinct forging and rolling operations are required to make a Bethlehem Wheel. The forging gives the metal density and toughness. The rolling produces a refinement in grain structure with a corresponding increase in strength and ductility. Each wheel is thoroughly tested and inspected at every step throughout the process of manufacture.

In addition to their endurance and wearing qualities Bethlehem Wrought Steel Wheels for electric railway service have a liberal margin of safety. The buyer may rest assured that he will receive from each Bethlehem Wheel many thousands of miles of trouble-free service.

BETHLEHEM STEEL COMPANY, *General Offices:* Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu

Export Distributors: Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM

Brill Trolley Buses

"Unqualified Approval in Rockford"

The change to trolley buses in Rockford "met with unqualified approval, with many favorable comments," according to A. P. Lewis, Manager of Transportation, Rockford Electric Company.

Reliability in maintaining 11.5 m.p.h. schedule with average of 11 stops and 3 right angle curves to the mile, quiet operation, rider appeal, long life and saving in operating costs from 4 to 5.6 cents per mile, are the advantages demonstrated by the trolley buses in Rockford, said Mr. Lewis.

THE J. G. BRILL COMPANY
PHILADELPHIA

CHICAGO OFFICE - HARRIS TRUST BUILDING
SAN FRANCISCO OFFICE - RIALTO BUILDING
THE J. G. BRILL COMPANY OF OHIO - CLEVELAND
THE J. G. BRILL COMPANY OF MISSOURI - ST. LOUIS
THE J. G. BRILL COMPANY OF MASSACHUSETTS - SPRINGFIELD

HOUSTON PUBLIC LIBRARY
HOUSTON
TEXAS

Traction Company of Johnson City, Tenn.

Selects Mack Small-Capacity Buses

Five Mack Model BG Buses are now being operated by The Johnson City Traction Company

The Johnson City Traction Company insisted upon offering transportation equal to that expected in the more congested areas. They required small-capacity buses but—they insisted upon large-capacity standards of quality and performance.

In studying the different makes available, they naturally considered the new Mack Model BG, and found Mack large-capacity standards were now available in a small-capacity bus. The Model BG met every requirement so—Johnson City Traction Company purchased five.

Mack Model BG long life, reliability, low-cost depreciation and low maintenance will assure increased profits for Johnson City as surely as other Mack Models always have in larger-capacity service.

If you are thinking of buying small-capacity buses, get the facts on this completely Mack-built bus. It's a six—designed to handle 21 seated passengers profitably in city service or 17 passengers for parlor car service. No longer is it necessary to accept inferior equipment for your small-capacity light routes.

Mack Trucks, Inc.
25 Broadway New York

Mack

THERE IS A MACK FOR EVERY ECONOMIC NEED OF THE INDUSTRY—17 TO 44 PASSENGERS

ELECTRIC RAILWAY JOURNAL

Graw-Hill Publishing Company, Inc.

JULY, 1931

Thirty-five Cents Per Copy

—the Trolley Bus Era

in • •

- —CHICAGO
- —DETROIT
- —SALT LAKE CITY
- —NEW ORLEANS
- —BROOKLYN—

Westinghouse-equipped Trolley Buses Serve

OUT of the darkness of the past zooms the Trolley Bus bringing in its wake new possibilities, new opportunities to the riding public and to electric railway operators.

The accepted public preference for the modern Trolley Bus in many cities of the United States, certified economic Trolley Bus operation from prominent operating companies, nation-wide interest in this modern tool of transportation—all mark 1931 as the era of the Trolley Bus.

Westinghouse equipment for the Trolley Bus, the Gas-electric Bus, and the Street Car represent the most efficient and progressive designs for every character of service.

Utilize the Trolley Bus, the Gasoline Bus, the Gas-electric Bus, and the Street Car wherever best suited. Each performs a service distinctly its own.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

WESTINGHOUSE ELECTRIC

T 31882

ELECTRIC RAILWAY JOURNAL

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Engineering Editor
GEORGE J. MACMURRAY
CLIFFORD A. FAUST
CHARLES J. ROGGI
J. W. MCCLOY

LOUIS F. STOLL
Publishing Director

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Vol. 75, No. 7

JOHN A. MILLER, JR., *Editor*

Pages 341-392

JOSEPH R. STAUFFER
Chicago
PAUL WOOTON
Washington
W. C. HESTON
Pacific Coast Editor
ALEX MCCALLUM
London, England

Send Them In!

MAINTENANCE MEN—the last period of the Electric Railway Journal Maintenance Contest closes July 31. Only one month—but ample time to enter your descriptions of new devices and methods for the competition. And remember, an individual cash prize of $100 will be awarded for the best item submitted during the year, in addition to the $25 quarterly prizes for each of the four divisions—rolling stock and shops, way and structures, electric and line, and buses and garages. Have you some "winning" ideas? Then send them in at once!

McGraw-Hill
Publishing Company
Inc.

Tenth Avenue at 36th Street
New York, N. Y.

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"MACHINIST, N. Y."

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1931

Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérét local et de Transports Publics Automobiles.

NEW YORK *District Office, 285 Madison Avenue*
WASHINGTON, *National Press Building*
CHICAGO, *520 North Michigan Avenue*
PHILADELPHIA, *1600 Arch Street*
CLEVELAND, *501 Guardian Building*
BOSTON, *1427 Statler Building*
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SAN FRANCISCO, *883 Mission Street*
LOS ANGELES, *632 Chamber of Commerce Bldg.*
LONDON, *Aldwych House, Aldwych, London, W.C.2*

Published monthly, with one additional Convention Number during the year. $3 per year, 35 cents per copy. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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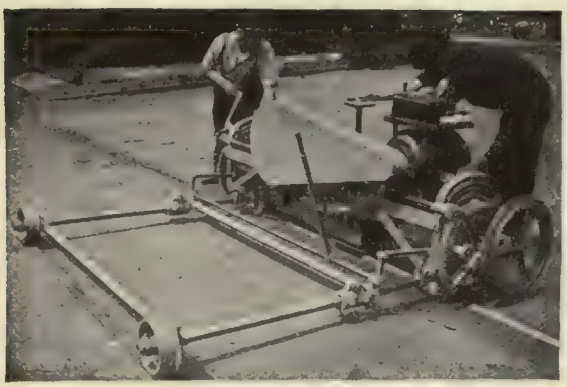
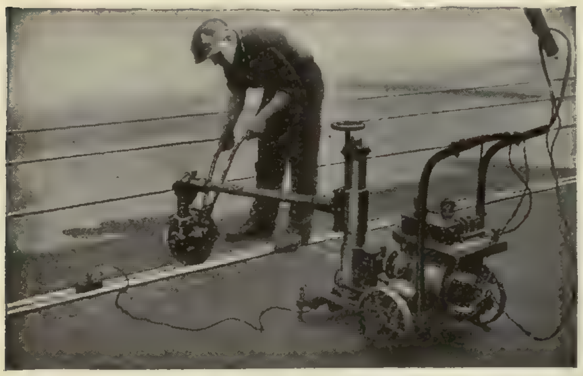
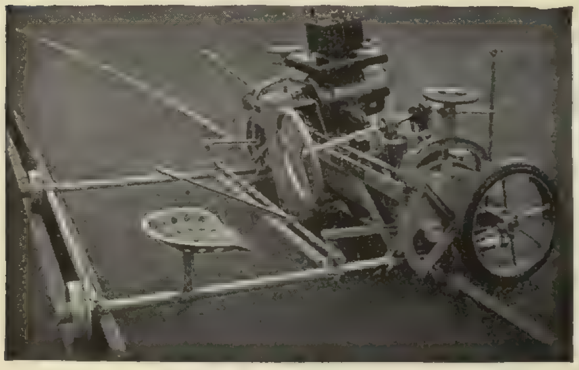


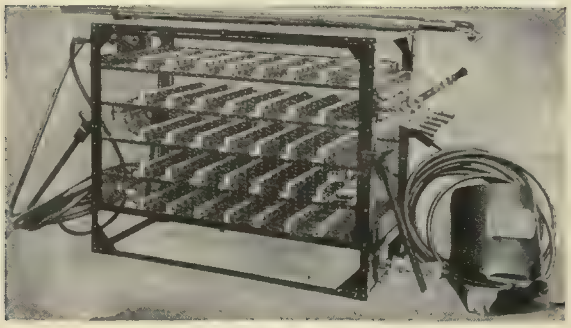
Vulcan Rail Grinder



Eureka Radial Rail Grinder



Improved Atlas Rail Grinder



Ajax Electric Arc Welder

What price savings?

HOW much will you pay to cut track maintenance costs four thousand dollars?

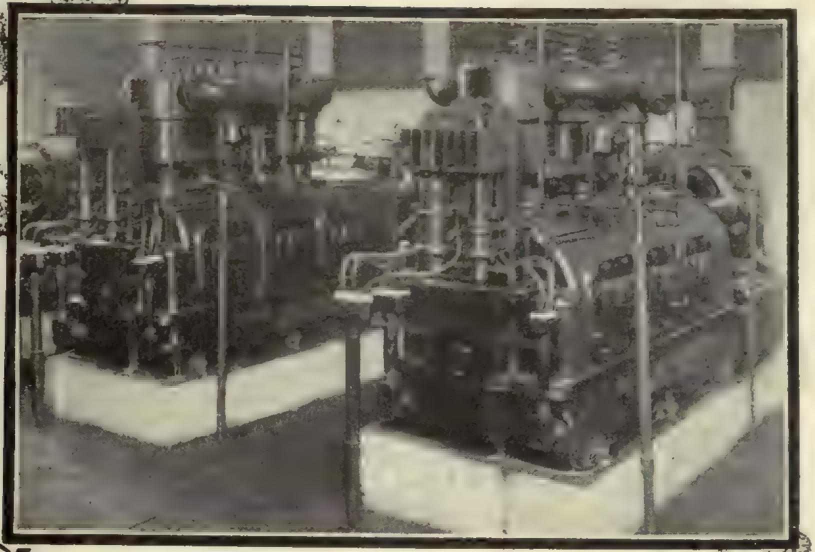
It will cost less than you offer if you keep enough of these modern track maintenance tools busy.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS
Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. La Salle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London
Railway & Welding Supply Company, Toronto, Ontario

5539



a "baker's dozen" in AIR COMPRESSOR VALUE

JUST as the old-time baker threw in an extra bun for good measure, so the builders of Westinghouse-National Air Compressors add extra value to the machines they build . . . They save valuable space for the user by designing compact machines that are driven direct by the motor or through efficient herringbone gearing . . . they save installation cost by making complete self-contained machines that need no elaborate foundation nor require extensive auxiliary apparatus . . . they save operating expense by providing complete Automatic Control of distinctive type—which insures that the power consumed will be in proportion to the air compressed . . . they save maintenance expense by building durable machines that will operate for a score of years with minimum time and material for attention and upkeep—thus maintaining the noteworthy tradition of "Quality Machines for Quality Service" . . . Sizes range from 2½ to 700 cu. ft. displacement—for power house, car barn, or shop . . . .

WESTINGHOUSE TRACTION BRAKE CO.
Industrial Division . . . Pittsburgh, Pa.

WESTINGHOUSE-
NATIONAL
Air Compressors

Cleveland adopts O-B Trolley Wheels

A Cleveland Railways Company car receives its five-inch O-B Wheel equipment and leaves the barn. This equipment is identical with that which averaged 20,785 miles for twelve wheels.

In a never-ending search for methods and materials which effect reductions in operating costs, Cleveland Railways Company last August started scientific tests on five different makes of trolley wheels. The tests were for the purpose of establishing definitely which would deliver the most mileage per dollar of cost.

Among others, twelve five-inch and twelve six-inch O-B Wheels were installed on cars of approximately 50,000 pounds weight. The St. Clair Ave. line was the proving ground, and it operates with a 600-volt current.

The tests continued through the fall months, into the sleet and and snows of winter, and finally were concluded near the end of March. Accurate records were kept on the performance of each individual wheel. The records for the O-B Wheels were:

O-B Five-Inch Wheels

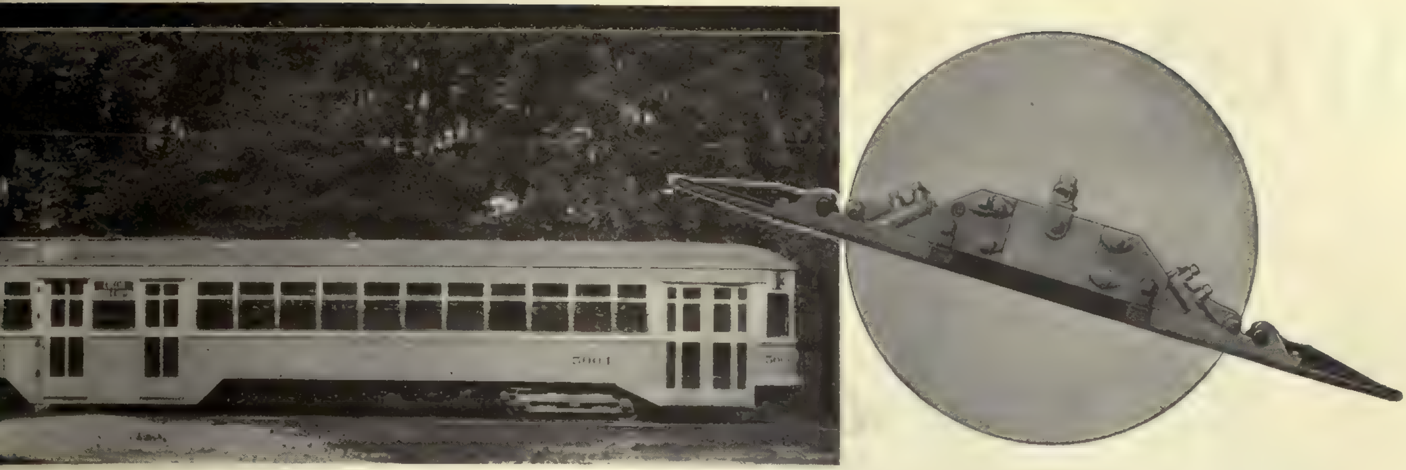
Average number of days in service	162½
Maximum mileage obtained	27,125
Minimum mileage obtained	16,711
Average mileage for twelve wheels	20,785

O-B Six-Inch Wheels

Average number of days in service	192
Maximum mileage obtained	28,020
Minimum mileage obtained	20,841
Average mileage for twelve wheels	24,407

Cleveland adopted O-B Five-Inch Wheels and more than four hundred cars have already been converted. That the change is made at this time is excellent evidence both of the money-saving performance of O-B Wheels and of the foresightedness of the officials involved in the decision.

Porcelain Insulators · Line Materials · Rail Bonds · Car Equipment · Trolley Bus Equipment · Headlights · Car Couplers



Cashing In On Last Years' Foresight

Dozens of overhead superintendents are today congratulating themselves on the foresight which last year prompted them to install section insulators with renewable underruns. The money and the labor they are saving merely by replacing worn units, instead of having to buy and install new insulators, is especially opportune just now.

That's the important advantage of O-B Renewable Underrun, Section-Insulators! After they are installed in the overhead they are permanent. No time-consuming, schedule-interrupting fussing with block-and-tackle is necessary. To be sure, the fibre center runners, the end runners, and the cam and arcing tips wear out. But the beam doesn't wear, and it stays in place year after year without attention.

When the underrun portions wear out it is a simple matter to renew them. By removing two bolts any or all units may be replaced with new parts. The cost of the parts is small, the operation is not difficult, and schedule interruptions are practically negligible.

Officials who plan ahead will recognize the desirability of considering next years' operating costs when specifying the materials to be used this year. Their foresight will tell them that additional profits which accrue from lower costs will be just as welcome at that time as they are now. And further, that a reduction in costs has an even greater influence on net profits than a corresponding increase in revenue.

Among such men, O-B Renewable Underrun, Section-Insulators will be favored because they give the greatest service per dollar of cost.

A large property in a midwestern city has bought and installed more than 1600 of this type of insulator during the past year. Such foresight is invariably reflected in lower operating costs.

OHIO BRASS COMPANY

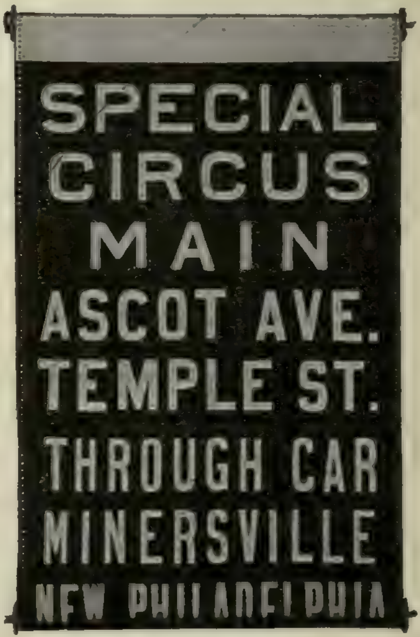
Mansfield, Ohio, U. S. A.

Canadian Ohio Brass Co. Limited Niagara Falls, Ontario, Canada

New York · Philadelphia · Boston · Pittsburgh · Chicago · Cleveland · St. Louis · Atlanta · Dallas · Los Angeles · San Francisco · Seattle

1428CL

HUNTER-KEYSTONE SIGNS



Front of Curtain

Avoid delays—tell them where you're going . . .

Hunter-Keystone illuminated destination signs "tell the public where you're going." They advertise your service and your different routes. They make easy the re-routing of cars and buses and give them a business-like appearance.

The curtains used in Keystone-Hunter signs under usual service conditions will last for many years. Should they become dirty and soiled with misuse it will pay to renew them. They are continually selling your service—keep them right.

Refer to our catalogs No. 7 and No. 9.

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District office at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver.

Rear of Curtain

WHY TWO MEN PER CAR, WHEN ATLANTA'S ONE-MAN CARS ARE

35.7% SAFER

9% FASTER

WITHIN the past five years, the progressive Georgia Power Company converted 80% of their cars for one-man operation.

This change resulted in a decrease of 35.7% in accidents, a 9% increase in schedule speeds and a reduction in operating costs sufficient to enable this property to provide exemplary service at a low rate of fare.

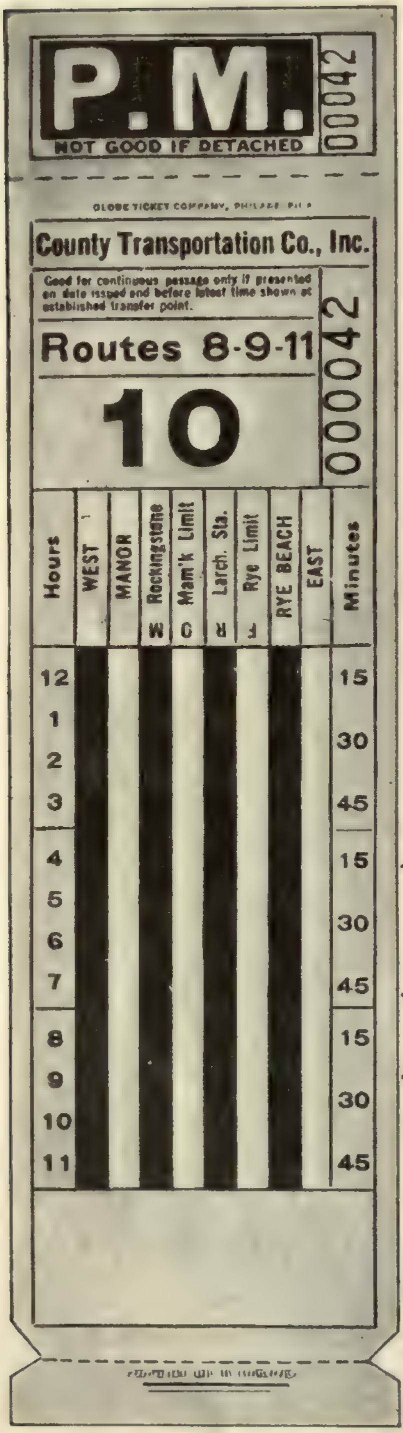
This is further proof of the economy, speed and safety of the N. P. Automatic Treadle Operated Exit Door. All of Atlanta's one-man cars are equipped with this device.

NP

NATIONAL PNEUMATIC COMPANY

...Do AUDITORS' FIGURES CHECK WITH TRANSFERS ISSUED?

THEY WILL IF YOUR FARE SYSTEM IS ENGINEERED—



P.M. 00042

NOT GOOD IF DETACHED

GLOBE TICKET COMPANY, PHILADA. PA.

County Transportation Co., Inc.

Good for continuous passage only if presented on date issued and before latest time shown at established transfer point.

Routes 8-9-11

10

000042

Hours WEST MANOR Rockingstone Mam'k Limit Larch. Sta. Rye Limit RYE BEACH EAST Minutes

W O R F

12 1 2 3 4 5 6 7 8 9 10 11

15 30 45 15 30 45 15 30 45

THERE are many ways to build up riding preference and to increase the number of riders. Modern, comfortable cars and buses provide plenty of value for every fare. *But*—do your books show that riding privileges are being used properly—or abused? In other words, do you actually collect a fare for every passenger?

Generally speaking—There is only one way to make sure that each passenger "pays." Use a protected *numbered* system of fare control. This does not mean a complicated system at all. In fact, even on very extensive properties, it is possible to operate very efficiently on a limited number of ticket and transfer forms.

Perhaps *your* property is one of the efficient ones. And yet, we are constantly showing operating executives how a few simple changes can save thousands of dollars annually.

We shall be glad to send samples of many successful transfers and tickets, or better yet, let us call on you and help you plan a modern ticket system.

GLOBE

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Factories:
Philadelphia Los Angeles Boston New York Atlanta
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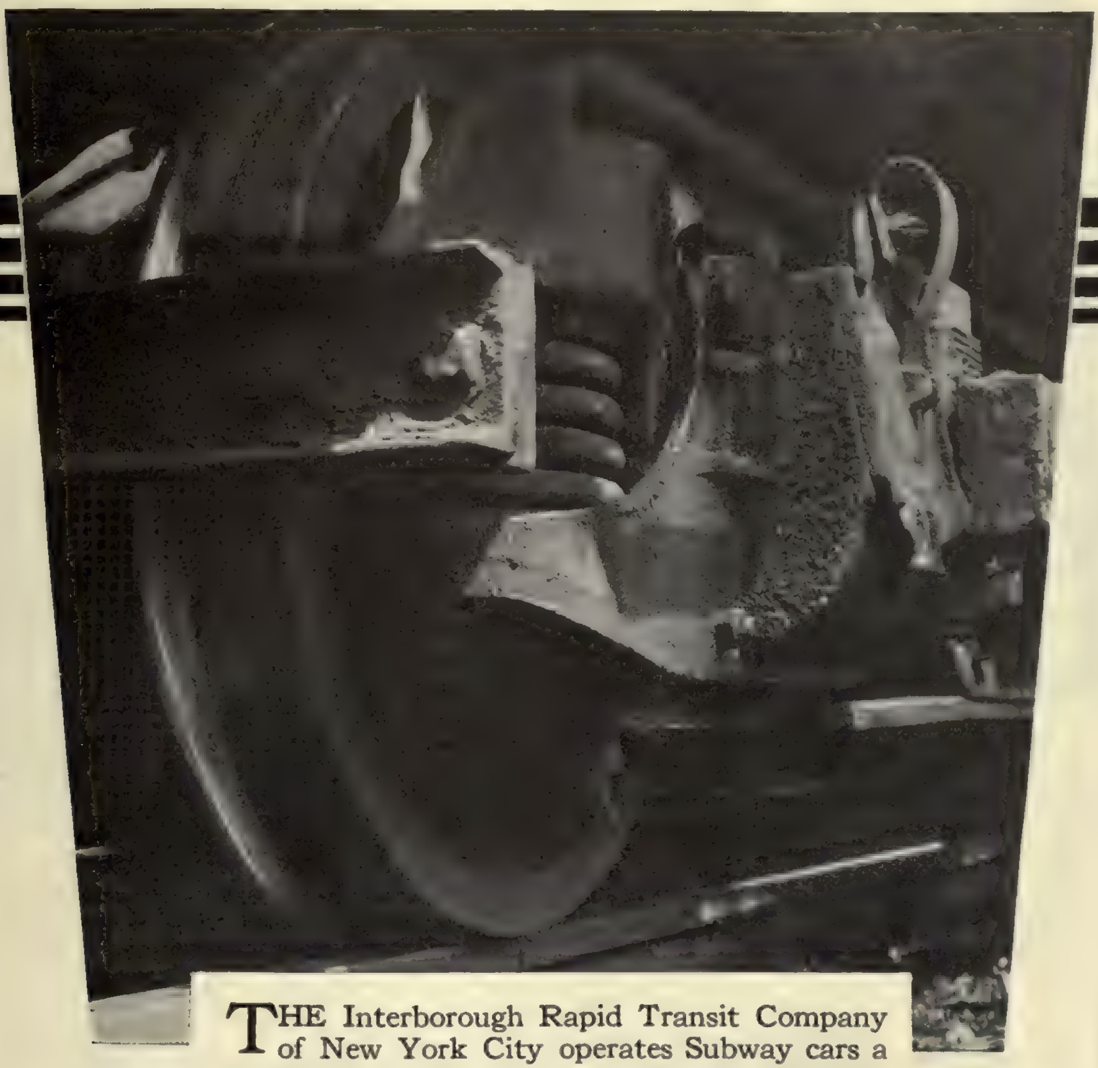
Long Life in a Severe Service



THE Interborough Rapid Transit Company of New York City operates Subway cars a maximum of 458 miles per day and Elevated cars 368 miles per day, with 1 minute and 48 seconds minimum headway on the west side during the rush hours. There was a total of 1,324,156,313 passengers carried over its lines during the year ended December 31st, 1930. Safety and long life are necessary conditions for their rolled steel wheels. They employ a most rigid wheel specification and inspection system which depends upon an exact system of records. Naturally, only the best of wheels are reordered by this road. We are proud to be continuously supplying them with Standard Steel Wheels.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICE & WORKS: BURNHAM, PENNA.

CHICAGO
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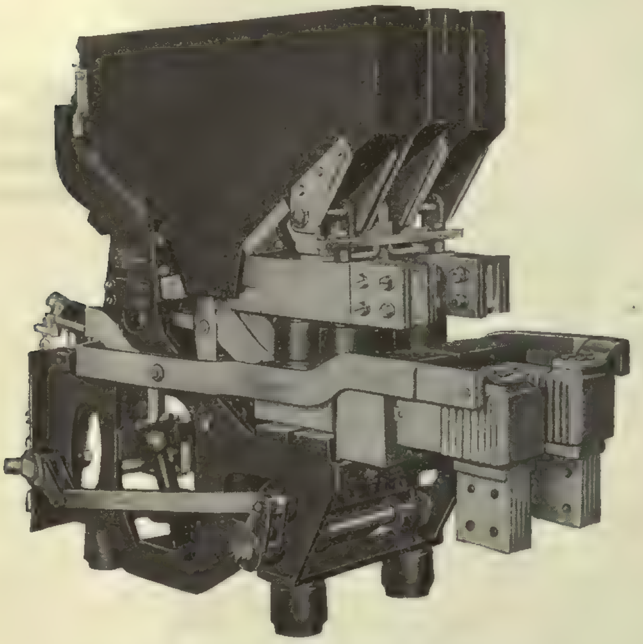
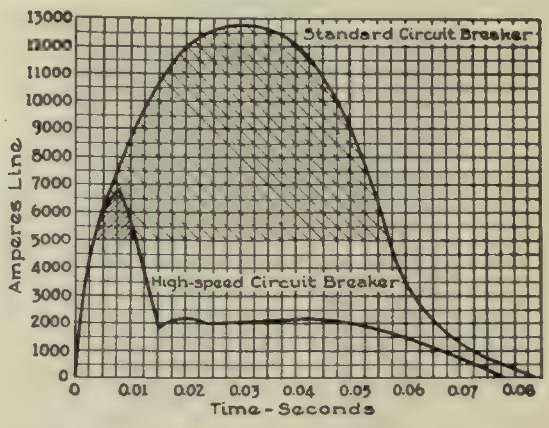
Good Protection Is Good Economy



Type JR-36, 10,000-amp., 600-volt, high-speed circuit breaker installed in substations of New York Board of Transportation

Type JR circuit breakers have made possible many improvements in substation design and protection



Short-circuit curve of 2200-kw., 3000-volt motor-generator set protected by Type JR circuit breaker compared with curve which would be obtained with standard circuit breaker

IN addition to the characteristics of the ordinary type of breaker, Type JR has the following features:

1. Extremely high-speed opening
2. Very effective rupture of arc
3. Electromagnetic tripping without mechanical latches
4. Electromagnetic, pneumatic, or manual closing
5. Trip-free feature for closing under load
6. Discriminating feature permitting selective tripping
7. Self-contained for installation in any convenient location

Approximately 2500 Type JR circuit breakers have been manufactured for the protection of conversion apparatus, feeders, and locomotives. They are available in standard designs for direct current ranging from 625 to 10,000 amperes and from 600 to 3,000 volts. For complete information, address the G-E office nearest you or General Electric Company, Schenectady, N. Y.

130-30

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

ELECTRIC RAILWAY JOURNAL

New York,
July, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Volume 75
Number 7

JOHN A. MILLER, JR., *Editor*

Enlightened Attitude Toward Labor Shown by Electric Railways

WHILE a majority of the employers of labor have made heroic efforts to protect their employees to the greatest possible extent during the present period of depression, a minority have shown a regrettable inclination to be hardboiled. The latter appear to have forgotten their fine words of a few years ago to the effect that an employee is a human being—something more than a mere cog in the industrial machine. Reduction of operating expenses rather than fair treatment of employees is now in the forefront of their minds, with a cut in the personnel as the easiest way. For example, a large industrial concern, which has not reduced its dividend rate, recently dismissed a substantial part of its force with the idea that the discharged employees probably would not be able to get work elsewhere and could easily be rehired again when conditions improve.

No one can deny that the position of the employer of labor in these times is a difficult one. He cannot find money to meet his payroll by waving a magic wand. Where there is not work enough to keep all the employees busy, however, the work usually can be divided so that each shall have a share of it and so retain a place on the payroll. This practice has been widely followed in the electric railway industry. Considering the seriousness of the general depression, the transportation business has held up well. Its problem of keeping employees at work has not been so acute as it has in most other industries. Nevertheless, revenues have been considerably curtailed, and the industry has had to reduce expenses as much as possible. On many properties the working day has been shortened and fewer days per week are being worked by the individual employee. There has been a slight decline in the total number of persons employed in the industry, but this has been brought about largely by natural causes. Vacancies created through employees leaving the service have not been filled. In only a few instances has it been necessary actually to dismiss any considerable number of employees because of lack of work.

That the good record of the electric railways in retaining their employees has been made at some sacrifice on the part of the companies is indicated by the reduction in net income figures. In the long run, however, this sacrifice will undoubtedly prove to have been well worth while. Good relations between employer and employee cannot be built on a mathematical formula. Mutual understanding of each other's problems is essential, as well as mutual consideration of the difficulties involved in the solution of these problems. By showing such understanding and consideration in these troubled times, the electric railways are building soundly for the future.

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Hope Triumphs Over Experience in Oregon Commission's Pronouncement

BASING its action on the theory that a lower fare will attract enough additional patronage to maintain or increase revenue, the Public Service Commission of Oregon has ordered the Pacific Northwest Public Service Company of Portland to reduce its fares. Under the new rate, which among other things reduces the cash fare from 10 to 7 cents, there will have to be a 32 per cent increase in traffic to maintain current levels of revenue. Certainly that is something to ponder. As President Griffith's comment indicates, the theory of the commission is not reasoning in the light of experience, but is rather another instance of the triumph of hope over experience.

The issue, however, goes deeper than rates. Net earnings of only $59,853 in 1930 testify to something amiss more serious than that. Since the company has not for a long time earned anything like a reasonable return on the investment, the case takes on the aspect of several similar situations in that the matter of valuation is not involved. Whether one accepts the $20,708,069 value of reproduction cost new as found by Carey & Harlan, or the reproduction cost new of $11,787,299 fixed by that firm when taking depreciation into account, the order of the commission is out of line with realities.

As a political gesture, the commission's action may be effective but adverse economic conditions are not corrected by political gestures. Portland needs an entirely new deal—it needs a new deal under franchise terms that will eliminate burdens now unbearable, one that will permit the system to be recast and rebuilt in the light of experience elsewhere. This is a large order, but it is to be hoped that the way out will be found before irreparable damage has been done.

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Times—and Automotive Engineers—Do Change

MUCH clamor has been raised from time to time against the street car because of the necessity for running on fixed tracks, its inability to turn out of its path to pass other vehicles, get out of the way of obstructions, or draw up to the curb. It is a matter of some surprise, therefore, to learn that the three new vehicle lanes on the Queensboro Bridge in New York City as well as on other bridges there, have tracks constructed in such a manner as to keep automobiles in line. These tracks consists of grooves 2 in. deep, and look considerably like the old-fashioned tram rail still in use on some trolley track. The engineers state that they are installing these automobile tracks as the best way to control traffic and reduce accidents principally by preventing one car from turning out and passing another. So, after many years spent in deriding the rail-bound vehicle for its lack of flexibility, the automotive engineers now have decided that, in order to prevent accidents, it is desirable to take away from the automobile that once-boasted freedom of movement and run it on tracks. Truly times—and automotive engineers—do change.

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Trolley Bus Activity World-Wide

DURING 1930 trolley bus systems in the United States increased in number from six to eleven, and total vehicles from 58 to 159, a remarkable growth. Thus far in 1931, an order for 29 additional vehicles has been placed by one company and an experimental system has been started by another. Several other companies are seriously considering early installations, and at least two of the present operators are planning extensions. This activity during a period of economic depression speaks well for the popularity of the trolley bus in this country.

Recent developments in other countries, moreover, indicate that the interest in the vehicle is world-wide. London recently placed 60 double-deck trolley buses in operation as the first step toward establishing an extensive system. Walsall inaugurated service in April, Wolverhampton and Bradford each added twelve vehicles recently, and thirteen other cities in England have announced plans for expansion. Outside of England and the United States, too, the expansion of existing systems or installation of new ones is under consideration in numerous cities.

From an odd-looking vehicle built in Germany in 1899, the trolley bus has developed into a form of transportation which now commands widespread attention. According to the most recent information there are altogether 53 systems in operation throughout the world—eleven in the United States; two in South America; six on the continent of Europe, 26 in England and Wales; five in Asia; two in Africa, and one in New Zealand. The available reports on the size of the various systems indicate that Chicago is first with 114 vehicles, Singapore is second with 105 and Shanghai third with 99. These cities are followed by Wolverhampton, 82; Bradford, 70; London, 60; Hastings, 58; Ipswich, 44; Rotherham, 36; Darlington, 32; West Hartlepool, 31; the Mexborough & Swinton, 30, and Salt Lake City, 26. In the comparisons of countries, England leads by a large margin with almost 700 vehicles. The United States is second with approximately 200 trolley buses.

From these figures, it is evident that the trolley bus has been adopted in every part of the world. While it does not yet rival either the street car or the gasoline bus in the scope of its operations, its growth has been remarkable and bids fair to continue at a rapid pace.

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Canadian Traffic Situation Encouraging

FOR several years American operators have watched with more than passing interest the reports of Canadian electric railways. While traffic in the United States was falling slowly but steadily, that across the border showed a constant upward trend. The situation continued so long that serious efforts have been made to discover the reason, and, if possible, to adopt methods in this country that will obtain similar results.

Statistics for the Canadian roads for 1930 have now been collected and compiled by the secretary of the Canadian Electric Railway Association. These figures show that the upward trend of the past ten years has now changed and that traffic of the Canadian systems in 1930 was less than in the previous year. This result was not entirely unexpected, for the depression that has affected the United States so severely has been felt in Canada, too. However, the drop in revenues has been somewhat less than it has been in this country. On the other hand, it has not been possible to reduce expenses in Canada to take care of the reduction in receipts.

In looking for the cause of these differences, attention should be called to the different status of the two countries. Canada is industrially much younger than the United States, and is not nearly so far advanced in the exploitation of natural resources. Population has been growing rapidly, and especially in the last few years there has been a steady tide of immigration. There also has been a growing concentration of population in the cities. Competition from private automobiles in Canada has not been lacking, nor has it failed to increase. But in 1930 there was only one motor vehicle registered to every eight persons in the Dominion as against one to every 4½ in this country. To some extent this is due to smaller individual incomes, particularly in the Eastern provinces. Moreover, the climate, with long winters and much snow, makes all-year operation of motor vehicles exceedingly difficult. A large influx of summer visitors assists the transportation interests at a time when local automobile owners have their own cars in service.

Accordingly, it would appear that the comparatively small recession in traffic of the Canadian systems may be only a passing phase, and that a resumption of normal business activity will see them regain their upward trend.

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From Independent Bus Operation to Co-ordinated Service

AWARD of a borough-wide franchise to the subsidiary of the Brooklyn & Queens Transit Corporation assures the outlying sections of Brooklyn efficient and reliable transportation by buses under a capable and experienced management. No longer will former taxicab drivers and ex-garage owners run bus lines on the principle of making the largest profit in the shortest time. In their past operations, little thought was given to the welfare of the community served. The public was inadequately protected by insurance against injuries. The personnel was irresponsible. These lines operated without franchises or certificates of convenience and necessity. They were inaugurated at a time when some form of transportation was urgently needed, and time did not permit the planning of a comprehensive system. And now that the needs of the rapidly growing sections of Brooklyn have made a comprehensive system of bus lines imperative, it has been entrusted to men with a transportation background.

Layout of routes and plans of operation were made after thorough study by engineers and officials of the company. Capital is available for the immediate purchase of 150 new buses and for the necessary storage and repair facilities. Management of the bus subsidiary will be unified with that of the Brooklyn & Queens Transit Corporation. Supervision of operation for both cars and buses will be centralized in a department of traffic and transportation.

The twenty routes granted by the franchise were laid out after careful consideration of the present and future needs of all sections of the borough. Although the bus lines are intended primarily to give convenient crosstown service in the southern part of the borough, they will, to some extent, supplement and feed the surface car lines and the rapid transit lines. Numerous transfer privileges between the bus lines and the surface lines at an additional cost of 2 cents will now permit traveling by direct routes between any two sections. In short, Brooklyn will have a co-ordinated rail and bus system in keeping with its importance as the largest borough of the metropolis.

Co-ordination Under Public Control in Prospect at London

CO-ORDINATION of the various agencies engaged in passenger transport in London has been under discussion in one form or another for several years. The number of competitive agencies has already been reduced substantially from what it was some years ago, but active competition continues between the tramways of the London County Council, the London Underground group and the affiliated London General Omnibus Company. To correct this situation, legislation has recently been sponsored by the Minister of Transport in the form of a bill to create the London Passenger Transport Board, which shall acquire and operate the several agencies now serving this territory.

It is planned to substitute securities of the Transport Board for those of the present companies. Thus the ownership of the property would remain in the hands of private investors. The securities are to have a fixed rate of return. Any surplus is to be used to increase or improve facilities. Rates of fare are to be under the jurisdiction of the Railway Rate Commission. Nothing quite like the proposed arrangement has previously been tried either in England or in America. In some respects it resembles the plan now in effect at Boston where the operation of the Elevated is under control of a Board of Public Trustees. Since the London Transport Board, however, would issue securities in its own name, the British proposal goes somewhat further than the Massachusetts arrangement.

Opinions differ concerning the merits of the plan. Everyone admits that co-ordination is desirable. Lord Ashfield, chairman of the Underground combine, has expressed himself in favor of the new arrangement and it has been indorsed at a meeting of the stockholders of the companies in this group. On the other hand, some opposition has been voiced on the ground that it would be undesirable to hand over to a public authority complete control of all the local transportation agencies of the British metropolis. Fear has been voiced that the board would not be free from political interference. Answer to this argument has been given that the board will be obliged to earn a predetermined rate of return on its securities and that inefficient management could not long endure. It is pointed out that the board can be removed by the Minister of Transport if found to be incompetent or negligent. That this would ever be done seems unlikely, however. Opposition was raised also by the London County Council, but this apparently was in the nature of bargaining for better terms and a satisfactory agreement has now been reached for the participation of this system in the plan.

In theory, at least, the project appears to have certain advantages. Whether or not it proves satisfactory in actual operation remains to be seen. If successful, it may suggest a solution of a problem which has lately been troubling a number of metropolitan centers in this country.

Ewing Galloway, N. Y.

Public transportation facilities play an important part in bringing thousands of patrons to the New York Theater district every night

BRINGING *the* CROWDS to the Theater

Places of amusement depend upon public transportation to bring the large majority of their patrons to their doors. Developing a mass appeal by offering an attractive product, merchandising and providing the maximum of comfort is an objective common to both the theatrical and the transportation industries

By

FLORENZ ZIEGFELD

GLARING lights announce to a pleasure-seeking populace a gay musical comedy. An eager crowd threads its way through the entrances and down the aisles to the seats. The orchestra strikes up a lively tune, the curtain rises and the audience is plunged into the romance of a carefully woven plot. The glamor of it all—the costumes, the girls, the scenery and the music—gives members of the audience a genuine thrill, and drives away dull care. To make this possible a vast organization has been hard at work behind the scenes, unthought of by the general public.

Few of the audience realize the painstaking effort required to prepare and present a theatrical production. Selecting the most appropriate kind of plot, arranging the lines and music, choosing members of the cast, and repeated rehearsals—all are arduous duties that must be performed before a show can be offered to the public.

But worries are cast aside when the show is greeted enthusiastically by a first-night audience.

Another seldom-considered organization which has played an important part in making the first night a success is that of the local transportation service. Although the success of a show depends primarily on its own merits, I do not discount the extremely important influence of public transportation facilities. It is true of all theaters, particularly the movie houses, that the proximity of street car, bus, subway and elevated lines determines to a large extent the amount of patronage that will be received. A certain class of people comes to the theater by private automobile or taxicab, but the greatest number use public transportation. And it is upon this class of patrons that the theaters depend for the bulk of their business.

Location Near Transit Lines Vital

In selecting the location for a theater the availability of transportation facilities is of tremendous importance. The Ziegfeld Theater, scene of many Ziegfeld hits, is close to the heart of the metropolitan transportation system in New York. The location at 54th Street and Sixth Avenue is a short distance away from the most congested part of the theater district, but the site is close to stations of the Seventh Avenue and Broadway Subways, the Sixth Avenue Elevated and the Fifth Avenue Bus lines.

Time is an all-important factor in this age of hurrying about. The public desires a rapid means of traveling between the home and the theater. That is one reason why rapid transit and surface transportation lines are so large a factor in bringing business to us. Because the curtain rises at a specific time, there is another important factor involved, the delivering of a great number of people in a brief period. In the Times Square theater district of New York City, for example, there are 80 theaters and places of amusement, with a total seating capacity of 147,000. Evening performances of musical comedies and revues start at 8:30, while most of the plays and long-run movies begin at 8:40 and 8:50. This means that most of the theater patrons enter the district within a period of 30 minutes. The continuous-run movie houses have patrons arriving at all hours, but the peak of their crowd comes during the same period during which the other theaters experience a rush. From these facts it will be seen that public transportation agencies in New York perform a stupendous job in delivering our patrons at a specific time.

Automobiles Could Not Handle All Patrons

An interesting deduction from the above figures is that if all patrons were to come by private automobile, a total of 73,500 vehicles, assuming two persons per vehicle, would attempt to enter the zone within a half hour. It is doubtful whether even 5,000 automobiles would succeed in gaining entrance and finding storage space in garages or on the outskirts of the zone where parking is permitted. In meeting this situation, mass transportation facilities not only make it physically possible to deliver everyone at the proper time, but also eliminate the discomfort of traffic congestion and parking difficulties. While New York has been referred to specifically, the same holds true for every other metropolitan center of the country, for in all cities a majority of the theaters are within a limited central zone.

One of the prime functions of an entertainment is to put the patrons in a happy frame of mind. However, I believe firmly in the theory that the collective receptiveness of an audience depends on the disposition of each individual at the start of the show. This means that public transportation facilities are charged with an important responsibility so far as we are concerned, in delivering our patrons in a good mood. Should they be held up by some delay, or should their feelings be

Florenz Ziegfeld

FROM an inconspicuous start in the theatrical business in 1892, Florenz Ziegfeld has become one of the most successful and best-known producers of musical shows in America. Always in the first rank of musical entertainments, his shows have set a standard which others have found difficult to approach. Mr. Ziegfeld's first notable efforts were in connection with the World's Fair in 1893, when he brought military bands from Europe and also organized and managed the Trocadero. He produced the famous Ziegfeld Follies, noted for "Glorifying the American Girl," from 1907 to 1927, and at present is introducing another edition. He also has presented many other spectacular musical productions. Through his many years in the industry Mr. Ziegfeld has been keenly aware of the important role public transportation plays in bringing patrons to the theater and the volume of business which each industry stimulates for the other. In this article he emphasizes the need for rapid, dependable transportation service and presents an interesting analogy between the two industries—both of which depend on pleasing the public by providing a maximum in attractiveness, comfort and convenience.

ruffled by discourteous treatment, they will not be in a mood to enjoy the show. It is equally important that they be returned to their homes safely and comfortably, so that they will look upon the entire evening as having been one of real enjoyment.

Theater managers the country over recognize the importance of good transportation to their business. Many co-operate on every possible occasion and even take the initiative in this effort. I know of several movie houses that have joint advertising campaigns with the transit companies, and I have even heard of some theaters refunding the car fares of its patrons. These efforts are highly commendable, since they result in more business for both the theater and the transportation companies.

Pleasing the Public a Common Objective

Fundamentally, both the amusement and transportation industries depend on a mass appeal to secure customers. Both recognize that the pubic is a discriminating one and that only by creating a definite appeal can the business be secured. First of all, we each must have a product that the people will want to buy. In the theater business we strive for the highest possible standard in show production, and obtain as many "headliners" as can be economically justified. Similarly, you try to keep your equipment in the best possible condition and run the cars as often as is consistent with good operating policy. In other words, we both strive to give the public the very best product that can be offered at the price we expect to get.

Secondly, having produced something in which we believe, we must let the public know about it. Advertising is a vital part of the show business, and probably plays an equally important role for transportation companies. In our business, there is a certain class of people which attends every show of the first rank. But there is a much greater number who are more or less indifferent and who must be sold on a show before they will attend. It is about the same with you. In the busy hours there are a great many people who ride your cars and buses consistently, but during the middle of the day and in the evening there are many who have no particular preference as to transportation means. Advertising brings the casual show attendant to our theater, and it brings to you those riders who might otherwise use a different mode of travel. In either instance, this additional business may mean the difference between profit and loss.

Courteous Employees a Real Asset

Producing an outstanding show and advertising it effectively serve to bring the prospective patron's to the door of our theater. Once there, it is important to extend them every possible courtesy while they are purchasing their tickets and while they are attending the performance. A box office attendant can ruffle a prospect so that he may not attend any of our productions in the future. On the other hand, courteous treatment often wins permanent friends for the management. But it is not only the ticket seller who is charged with this responsibility; the same holds true also for the ushers, doormen and all other employees. This is a phase of handling the public in which your industry also is vitally interested. Courteous motormen, conductors and bus drivers accomplish a great deal in winning friends for your company. Many deficiencies in a product are overlooked if a tactful, interested employee impresses upon the patron a sincere desire to accommodate.

Inside the theater we have the same problem of pleasing the patrons by providing comfort and convenience. Restful seats, ample knee room, effective lighting, proper temperature and adequate ventilation all contribute to the comfort of our patrons. These elements are under constant study with a view toward improvement. The wide use of refrigeration for cooling theaters during the warm months is an example of our endeavors to make the customers more comfortable. In your industry you consider spring cushions, leather and plush upholstered seats, ample knee room, good lights and proper heating and ventilation of first importance in making the ride attractive.

Convenience, also, is a factor not to be overlooked. The location and width of aisles, the provision of numerous exits and the arrangement of stairways to the balconies all figure prominently in making the theater convenient for the patrons. In the same way, wide aisles and doors, hand holds and properly located doors aid your passengers in getting into the vehicles and leaving them quickly.

Pleasant Interiors Create an Additional Appeal

Though the major appeal for our patrons is centered in the production itself through the characters, the costumes, lighting effects and staging, they must be supplemented by attractive surroundings within the theater. This is accomplished by the scheme of interior decorating, colored lights in attractive fixtures and numerous ornamentations. It would scarcely be feasible to adopt the same degree of decoration in a public vehicle, because it is intended primarily for utility, but probably some of the ideas could be used. It is an accepted fact that people really do appreciate pleasant surroundings. Undoubtedly this is true even when traveling from one part of the city to another.

From all this it will be seen that the theatrical and transportation industries have certain problems and certain interests in common. Good transportation service promotes theater attendance, and good theater attendance promotes increased use of the transportation service.

This is the fifth of a series of articles by prominent men outside the electric railway industry, expressing their views on transportation subjects. The sixth will appear in the next issue.

In the August Issue

A searching analysis of the financial problems of the local transportation industry

by

Francis H. Sisson

Vice-President
Guaranty Trust Company of New York

Convinced of the vital importance of mass transportation, he has a number of cogent suggestions for placing the service on a firm financial basis

Well-Planned Schedules *Speed* SUBWAY TRACK CONSTRUCTION

By

Robert H. Jacobs

Division Engineer Board of Transportation
New York City

Rails bolted together and laid loosely in the trackway

Jacking up the rails for placing ties and tie plates

Driving screw spikes in prebored holes. Short ties are 2 ft. 6 in., and long ties for third rail support are 3 ft. 10½ in.

STANDARDS of track construction for the new subway lines in New York City represent a normal development based largely on experience of the companies operating existing rapid transit lines. As in the construction of the subway structure, the specifications for all track construction and materials are prepared by engineers of the Board of Transportation. The work itself, however, is done by local contractors who have been awarded contracts for definite sections of the line, depending upon the continuous length of completed structure. In the past, contracts have varied from lengths of 5 to 20 miles of continuous track. Engineers of the Board of Transportation with their inspectors are in the field during the progress of the work to insure that it is done in strict conformity with the specifications, and to give all necessary lines and grades for the work. All track material, except concrete and a few minor items, is purchased by the Board of Transportation and furnished to the contractor.

The most important change from former track construction practice is the adoption of the concreted type of track throughout, except for special work, short sections of track between special work, lay-up tracks and yard tracks. The rails are independently supported on short creosoted ties of long-leaf heart-wood pine, 2 ft. 6 in. long, spaced, 22½ in. apart with an 18-in. spacing at the rail joints. Longer ties are used for the third-rail supports. Concrete is poured to the top of the tie with a slight slope toward the center of the track. A trough, 2 ft. 5 in. wide and from 7½ in. to 10½ in. deep at the center, is formed between the ties, with drain boxes at intervals as required to meet local conditions. Screw spikes are used with the tie plates having bosses to support the heads of the spikes so as to leave a space of

$\frac{1}{16}$ in. between the base of the rail and the underside of the head of the spikes.

The subway structure is built to conform to theoretical dimensions within the limits of practical construction practice. The small operating clearances planned require that a detailed survey of the structure be made before installing the tracks, and in some cases alignments and grades must be adjusted to assure proper clearances. Line and grade points are established on the subway walls at 20-ft. intervals, and the location of insulated joints, switch machines, automatic stops, and conduits for feeders, negative returns and other cables are also marked. This work is well advanced before the actual track construction.

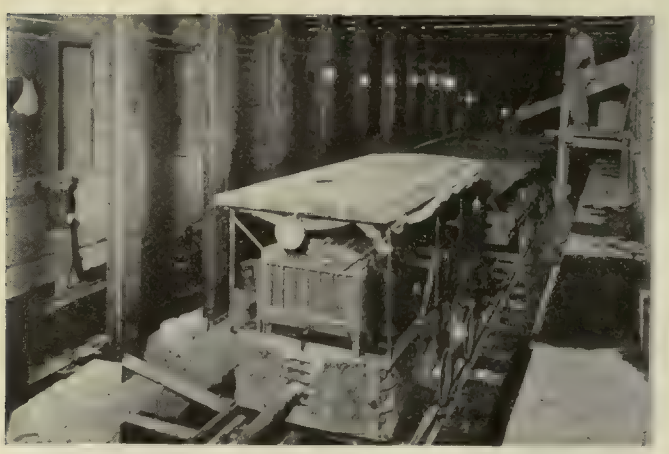
Leveling and spacing ties

METHODS FOR GETTING MATERIALS INTO SUBWAY

Rails, special work and fittings are hauled by trucks of the track contractor from convenient freight stations to the work. Ties are delivered along the site of the work at points convenient for getting them into the subway. Selection of such places is an important factor governing the progress of the work as well as the cost to the contractor. The rails, special work and most of the fittings are usually introduced into the subway through suitable station entrances. A portable power hoist unloads the rails from the trucks after which they are skidded down temporary ramps to the station platform. The rails are then loaded with a block and fall on flat cars driven by a gasoline engine. About 30 rails, with angle bars and track bolts, can be loaded on each flat car. A derrick on the flat car places the rails continuously along the trackways of the subway where they are immediately bolted and gaged loosely, allowing the car to proceed and to lay more rail.

Concrete mixer obtains batches of sand and coarse aggregate properly proportioned from truck with compartments for each batch

After the rails for a designated section have been placed and bolted, ties and track fittings are distributed along the line at convenient points. The ties and tie plates are set in place by raising the rails with jacks. After the track is raised to the approximate line and grade, precast concrete pedestal blocks, spaced 8 ft. apart, are placed under the base of the rail. These pedestal blocks are made to the same specifications as the concrete in the track and become a part of the track structure. The tops of the pedestal blocks are set about 2 in. below the base of the rail for the insertion of wedges to make the final adjustment. The rails rest on these blocks so that the bottom of the ties hang about $7\frac{1}{2}$ in. above the invert. In general, four line and four gage braces are used for each rail length on tangent tracks, and five on curves to hold the track in place. These braces are cut short to permit final adjustment of the line and grade by wedges. After the track is checked for line, gage and surface, concrete is poured. The only forms necessary are those placed along the ends of the ties to construct the trough. Construction of the concrete track is carried on and completed in sections of 1 mile.



Galvanized iron chute conveys concrete to side-dump cars driven by a gasoline locomotive

Concreting begins at both ends of section and progresses toward the center

The concrete mixer, having a capacity of 1 cu.yd. is located on the street surface at about the center of the section to be concreted. Concrete is conveyed by chute to side-dump buckets in the subway through a 10-in. galvanized iron pipe chute. The chute is carried from the street surface through a duct manhole or a ventilating chamber to the buckets. The pouring of the concrete is begun at the two extreme ends of the section simultaneously, progressing toward the center. Six buckets, each having a capacity of about 2 yd., are driven by a gasoline locomotive under the chute to receive the concrete. Three buckets are placed on each side of the locomotive, one set of buckets being filled and driven to the end of the section and dumped, while the other set is left under the chute to be filled with the concrete. The engine then returns to the chute with the empty buckets, hauls the others, which are filled by this time, in the opposite direction. This operation is repeated, finally closing in the works at the chute location. For greater speed two locomotives are sometimes used.

Batches of Coarse Aggregate Hauled from Yards

Rigid inspection of the work and frequent checking of the track for line and grade are necessary, as the success of this type of track is largely dependent on its accuracy and the thoroughness with which ties are embedded in the concrete. The proportion of aggregates, the control of water and the thorough mixing of the concrete follow the accepted practice for this class of work. The aggregate is delivered to the mixer in compartment trucks, each compartment carrying the correct proportion of sand and crushed stone for a batch. The aggregate is unloaded directly from the truck to the mixer. Concrete is mixed in the proportion of 1 : 2 : 3.85, ¾-in. crushed stone being used for coarse aggregate.

The concrete is poured for the full depth of the track construction in one operation and thoroughly spaded or tamped under the tie. Depressions in the surface of the concrete are provided for the placing of rail anchors. After the concrete is poured and thoroughly tamped, the surface is finished by troweling. Care is exercised in troweling the surface of the trough in order not to honeycomb the concrete around the ties. Concrete is poured at the rate of 800 to 900 ft. of track per working day, exclusive of the time taken in changing the location of the mixture. About ⅓ cu.yd. of concrete is poured to a running foot of track.

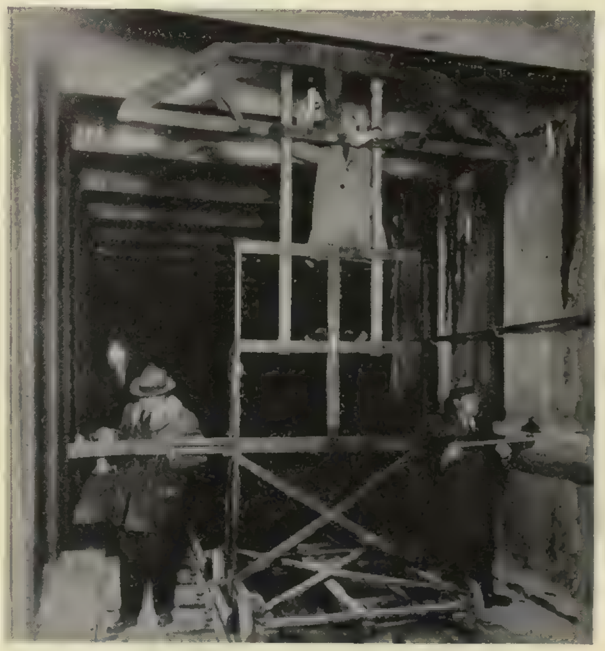
Prior to pouring the concrete, a full-sized clearance templet is run over the track to insure that proper car clearances have been provided. Concreting is followed up promptly after the track has been finally checked by the track inspector with special gages and templets and necessary adjustments are made to bring the track to accurate line, gage and grade, corresponding with the marks on the walls of the subway. No construction trains are allowed to run over the fresh concrete until after a period of at least 36 hours.

As a measure of economy and in the interest of faster work, the laying and bonding of the contact rail, installation of the insulated joints and of conduits in the track ways are included in the track contract. The contractors' equipment for handling the track material is also suitable for handling the contact rail. In this way, the work can be carried on in connection with the construction of the track itself. A standard section of the contact rail is 150 lb. per yd. The insulators on which the contact rails rest and the brackets for the contact rail protection boards are supported on the longer ties placed for that purpose. Insulated joints are installed in the track at the time of track laying.

The necessity of providing for positive and negative cables, lighting, escalator and circuit breaker connections requires that a large number of conduits be placed in the trackway. These conduits are all placed in advance of the concrete work. In this manner, delays and interference are reduced to a minimum. Provision is also made for the installation of signal and interlocking apparatus to be installed under other contract.

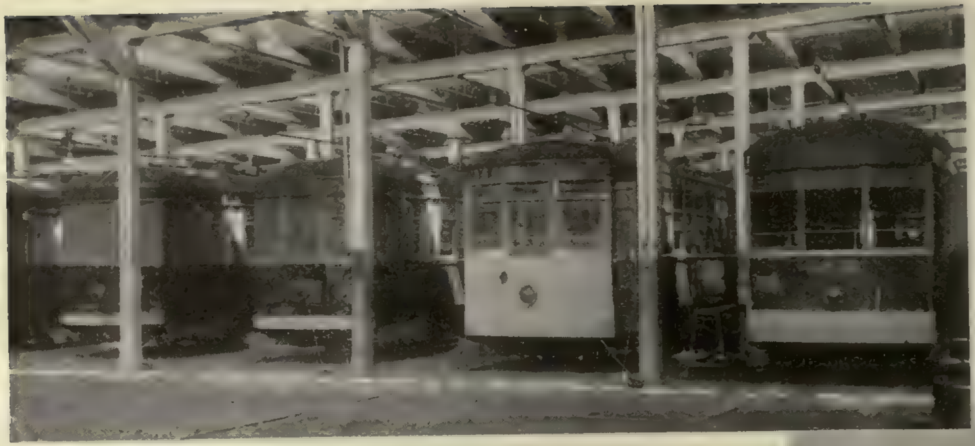
Spading and troweling concrete in the trackways

Checking line, grade and gage of track before the first set in the concrete



Checking for car clearances with full-sized templet

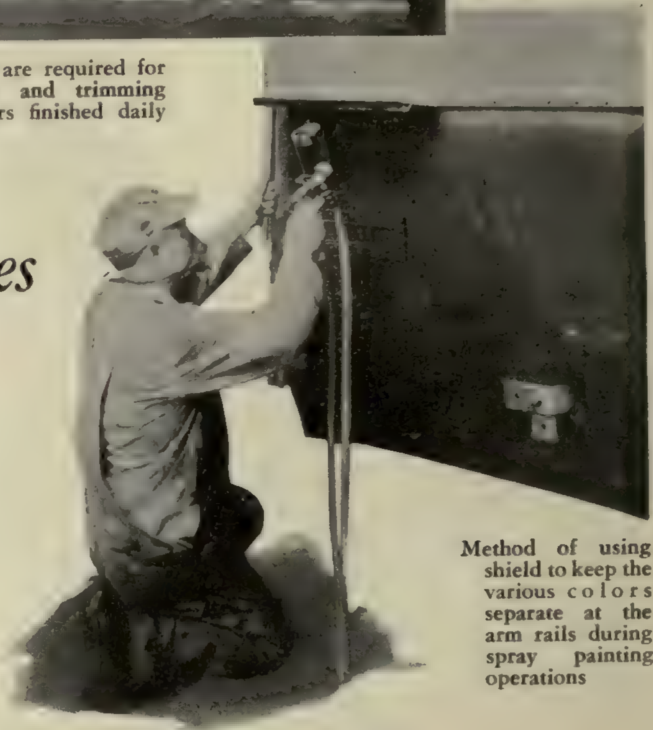
A finished track ready for service



Six tracks with two cars on each track are required for washing, sanding, glazing, painting and trimming operations on a schedule of two cars finished daily

Painting Cars and Buses

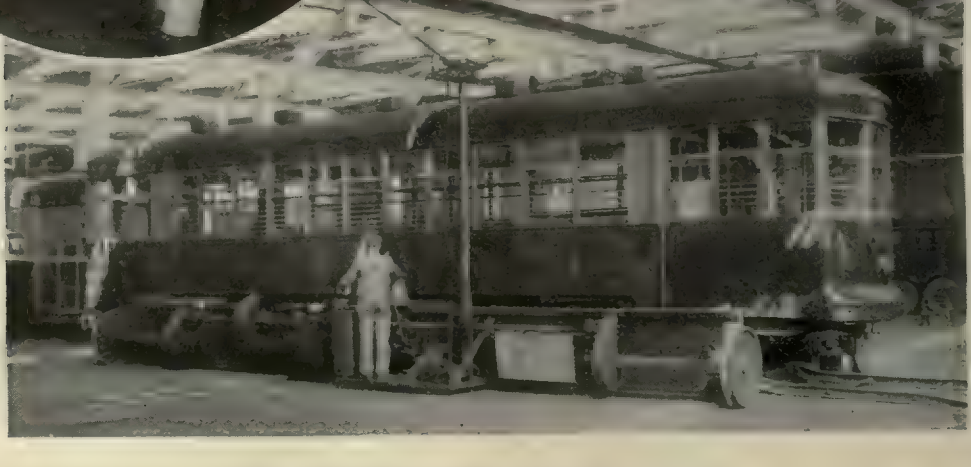
at Kansas City



Method of using shield to keep the various colors separate at the arm rails during spray painting operations

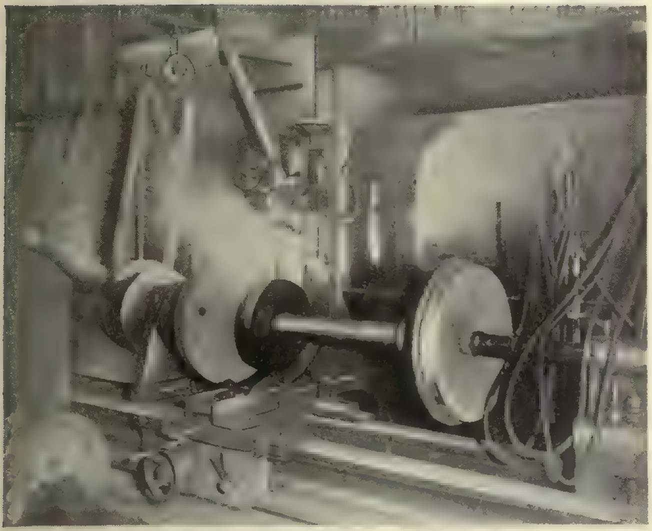
Ready for spray painting

Cars are placed as desired in the paint shop by means of the transfer table

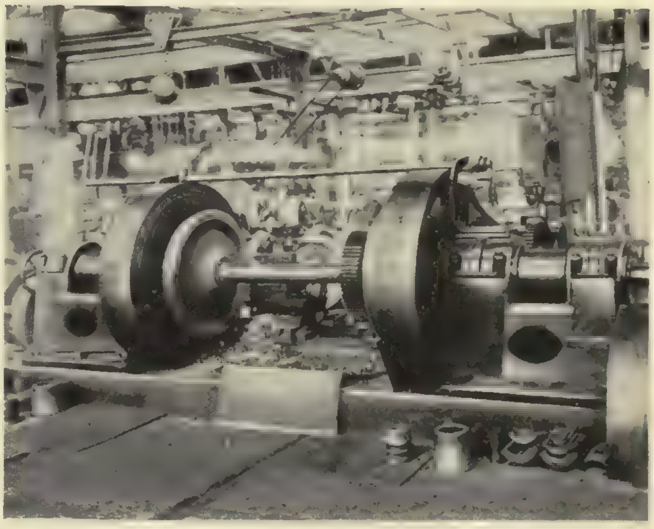


Putting Car Maintenance *on a Calendar Basis*

Inspection, repair and overhaul programs at Kansas City are based on calendar and car-series schedules. Better planning of budgets, materials and labor, standardization of shop practices and positive control of maintenance costs are advantages of this method



Automatic wheel welding



Wheel flanges and treads are reshaped in this machine after flanges have been built up by welding

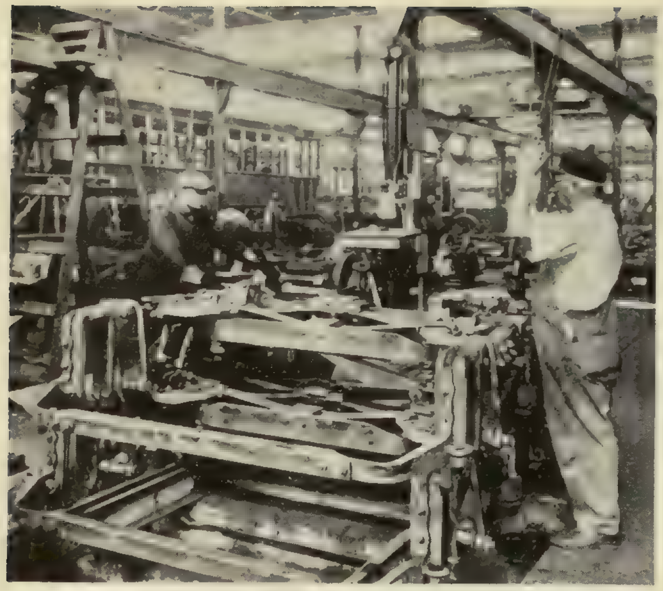
SO SUCCESSFUL was the method followed in the rehabilitation program of the Kansas City Public Service Company in 1927 and 1928, when all the rolling stock was put through the shop by type groups, that running inspections, minor repairs and overhaul have now been placed on the calendar car-group basis. Two years' experience with this plan has developed standardized practices, specialized crews, and a system of concentration on equipment by type that gives better results at greatly reduced cost.

Definite knowledge as to dates for overhaul of any group of cars permits advance planning for materials required for the particular type body, truck and motor. Reduction in storeroom inventory is thus made possible. For example, if a certain group of cars with special types of bodies, trucks and motors are not due into the shop for either heavy or light overhaul during the current year, materials required for these types are stocked only in such quantities as are required for normal replacement. The plan also permits the placing of material orders in larger quantities, since overhaul of like equipment is concentrated.

Shop practice and operations are standardized because the equipment on the cars in each group is the same for the most part. The general condition of a series of cars can be more clearly recognized when they are overhauled as a group. Advance knowledge of the due date of any series of cars allows the shop to accumulate and repair spare parts, and hold them for use on the job when it arrives.

A pre-overhaul examination of an entire group of cars is made far enough in advance of the due date to permit placing purchase orders outside and store orders with the shop for the quantities of materials required for the job. This permits an estimate of general conditions, and an accurate knowledge as to the number of roofs, floors, sills, curtains, etc., needed.

The calendar-overhaul plan necessitates close co-operation between the operating and maintenance departments. It is necessary to equalize approximately mileage operated by all cars in a series. Previous mileage records and car schedules were carefully studied, and a system of assigning cars to a definite amount and kind of work was put into effect. Maintenance schedules on the calendar basis were then made up by which all cars are now inspected once a week, or, approximately, at the end of every 750 miles run, and are assigned to the shop for overhaul at the end of each fifteen-month period. Because inspections and overhauls are of two distinct kinds, the cycle for a complete inspection covers two weeks, and for a complete overhaul it covers 30 months.



The truck shop, motor floor and wheel floor are equipped with five 24-ft. span overhead traveling cranes

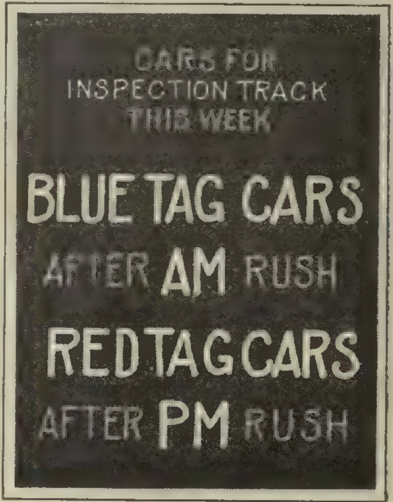
Present inspection practice provides that all cars shall be inspected once each week. One-half of the cars receive a general inspection, done in the daytime, and the other half a "light," or lubrication, inspection, done at night.

The system used for assigning cars to inspection periods is simple and positive. A metal tag is carried in the front vestibule of every car. One-half of the cars are identified with red tags and other half with blue. These tags show the division to which the car belongs, the day of the week upon which the car is to be inspected, and the specific track on which it is to be placed. One-week blue-tag cars receive the general inspection, while red-tag cars receive the light inspection; the next week on the same day the red-tag cars receive the general inspection, while the blue-tag cars receive a light inspection. If a car is to receive the general inspection, it is placed on the inspection track after the morning trip, and if it is to receive a light inspection, it is brought in after the last trip. A sign is placed at the entrance and exit to each yard to indicate which group of cars is to receive the general inspection that week, and which the light inspection. The sign is changed every Sunday so as to alternate heavy and light weekly inspections.

Lathe and planer operations are performed in this section of the machine shop. Tool room is at the right

Seven double-truck cars is the daily quota for one inspection crew. The crew consists of five men: controller inspector, electrical inspector, truck and brake inspector, car body inspector and lubrication inspector. At four of the division carhouses in Kansas City, one inspection track, manned by a standard crew of five men, is maintained. At the Brighton carhouse, two tracks and two crews are necessary, and at the Harrison carhouse three are required. Inspection crews are under the direct supervision of a chief inspector where there is more than one crew. Where there is only one crew, the electrical inspector is known as the "lead" inspector and he has direct supervision of all work.

The following instructions, issued to the maintenance personnel at the Harrison carhouse, will serve further to explain the operation of this inspection system.



Yard entrance sign indicating type of cars due for inspection

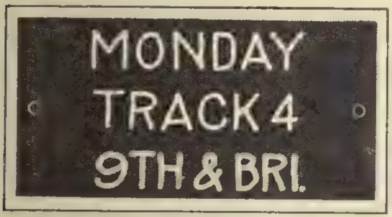
> On week days, Monday to Friday, 25 cars will be inspected during the day and 25 at night on the lubrication inspection. On Saturday, fifteen cars will be inspected during the morning and fifteen at night. This plan will permit the inspection of 280 cars each week, one-half of which will have the general inspection and one-half the night lubrication inspection.
>
> The day inspection will be divided between three crews, and each crew will always inspect the same cars at each inspection. The crews will be designated as crews No. 7, No. 8 and No. 9, and the inspection tracks will be numbered in the same manner. Two crews—for example, Nos. 7 and 8—will inspect eight cars each, and crew No. 9 will inspect nine cars. The cars should be divided so that crew No. 9 will get all the single-truck cars and cars on which the inspection work is lighter. In other words, crew No. 9 should get, if possible, seven double-truck cars and two single-truck cars each day, in order that their inspections may be completed in the same time required for the other crews to work on eight cars each.
>
> In dividing the cars among the three crews, the foreman should use care to see that one crew does not get too many cars of a better condition or more modern type than another, as each crew is rated on failures, and fairness in dividing cars may prevent disagreements later. If possible, it is further recommended that the Saturday morning cars be of a type not requiring excessive inspection work, as only five hours are allowed for the inspection of five cars, or an average of one hour per car instead of the standard time of one hour and ten minutes.

Each carhouse maintains a record of failure and pull-in reports, and posts a weekly report showing each inspector's name and the number and kind of failures that occurred on his particular part of the equipment. The carhouse foreman settles any disputes regarding classification of these failures. The ranking of a crew is based on the total number of failures charged to its members.

Economy meter readings are recorded on both inspections, so that a general check will be obtained on the actual service of the cars between inspections. Although the division supervisors are responsible for the inspection of cars and seeing that none are missed, the office of the superintendent of equipment, through the mileage clerk, also has a check by the kilowatt-hour readings of any cars missed. In other words, if readings on a car are not reported, it is an indication that an inspection was missed and the division carhouse will be notified immediately.

Written instructions and procedures are placed in the hands of every member of a maintenance crew. Work is so planned that an inspector will not interfere with another member of the crew, but can, at proper times, assist any other inspector. Each makes only such repairs and adjustments as are ordinarily made in connection with regular car inspection.

A standard inspection report has been adopted which shows equipment failures from one general inspection to another. It also lists the repair work to be done by repair crews before the next general inspection. This form is a complete condition record of the car and is kept up to date at all times by either the inspectors or the clerk, in whose keeping it remains between inspections. Inspectors responsible for the condition of the equipment on the cars are required to sign this report at each inspection. This not only directly charges them with the condition of parts under their care, but puts an expert O.K. on the car as a whole before it is put into service again. This report has proved valuable to the legal department on many occasions in accident cases.



Tag on car shows when and where it is to be placed for inspection

The completeness of this performance record and inspection report is worthy of note. Space is provided for the car number, the inspection day and the meter reading at the last general inspection. Some operations are not performed at every general or two-week inspection. For example, side and center-bearing inspection for lubrication is not required oftener than every four weeks, which is every second inspection; slack adjusters require lubricating only every six weeks, which is every third inspection; therefore, alongside the general inspection number heading, the carhouse clerk marks the number 1, 2, or 3, meaning that the car is having its first, second or third inspection, and the inspector knows just what operations are to be carried out.

Five blank spaces under various mechanical headings are used to record equipment failures since the last general inspection. Information for these spaces is secured by the carhouse clerk from various sources, and he immediately makes notations to guide repairs at that particular car's next inspection. The carhouse clerk also lists any equipment changes. For example, a CT-25 compressor is replaced by a DH-16 type. This information is taken from this form in the equipment office, and records in the files are brought up to date by record clerks. A space is provided and filled in by the supervisor of night, or light, inspection, which consists principally of lubrication, brakes and control equipment. On the reverse side of this form any special repairs to be made at the next general inspection are noted.

Armature shafts and commutators are being turned and bearings and pinions fitted in this section

For the 30-month complete overhaul, and for the fifteen-month lighter job, sixteen cars of one group are brought in. Three five-day weeks is the period required to overhaul and paint a car. Six tracks with two cars to the track are used in both the overhaul shop and the paint shop. One truck and motor, or light overhaul, and one heavy or complete overhaul are assigned to the same track since both cars are due on the same day. Each day, certain operations are performed. Every car is equipped with a large figure 1, 2, 3, etc., denoting the day of overhaul the car has reached. This also applies to the truck, motor, and electric repair floors. The routine is systematic and reduces supervision, and also reduces the likelihood of delaying a car in a space scheduled for a following car. Operations are so arranged that the minimum amount of interference between door and step man, air man and electrical man will occur.

From more than two years' experience with the plan of overhaul by calendar and series of cars, very satisfactory methods have been evolved, costs have been considerably reduced and a better grade of work resulted. Specialization of workers, standardization of operations and concentration of types of equipment have made possible the smallest shop personnel in the history of the railway company.

Materials and processes are tested in the chemical laboratory before they are adopted as standard

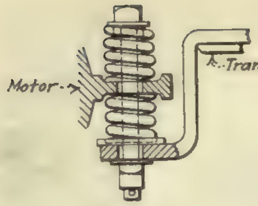


FIG. 1

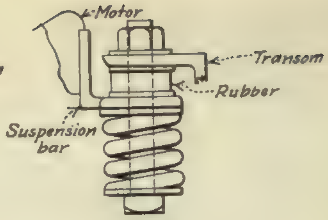


FIG. 2

Fig. 1—Suspension with nose at center of motor

Fig. 2—Motor bar suspended. One spring assembly at each end of motor

Making Motor Suspension Springs *Adequate*

SPRING suspension of the nose of an axle-hung motor may be worse than useless unless the springs are: (1) Strong and stiff enough to take maximum load without going solid or breaking; (2) soft enough to deflect under loads that the motor can impose; (3) so arranged that there is no sideway, restraint on the motor. Many equipments now running fail to meet one or more of these requirements.

It is fairly easy to select a spring of proper dimensions to meet the first two requirements. Most trucks have such springs in them originally. However, the second requirement may be completely defeated by tightening the spring with the suspension bolt until the stress set up is greater than that caused by any load the motor can deliver. There will then be no further spring deflection under load, and the motor might as well be resting on the transom. It is receiving no protection from road shocks.

Springs should have little or no initial compression other than that caused by the motor weight. The spring system should be so designed that there is a definite stop to prevent excessive tightening of the springs. This should not be left to the judgment of the workman, since the tendency almost always is to pull the bolts up as tightly as possible.

The design should be such that all motions of the axles relative to the truck are unrestrained by the spring system to the limits of wear of the truck parts; but many spring systems are designed with little or no consideration for the effect of wear and variations in the truck and motors.

Wear occurs on the thrust surface of the journal bearing against the axle, on the thrust surfaces of the journal bearing and journal box against each other, and between the journal box and the pedestal guides. This wear plus the initial clearances may total ½ in. to ¾ in. unless the same clearance exists in the suspension arrangement between the motor and the transom, the motion between the axle and truck will be restrained by the motor. This will throw loads on the motor axle bearings far beyond what they are designed to carry. Hot bearings will result.

The various spring arrangements in common use are shown in Figs. 1 to 5. The types shown in Figs 1 and 2 apply generally to practically all motors of less than 65-hp. rating. The chief defects in this design as usually built are: First, too little clearance for the bolt, and second, no provision to prevent setting up the spring too tight. The first results in bending or breaking of bolts, and sometimes breaking of springs. The second means little or no spring suspension.

On larger motors the commonest construction is that shown in Fig. 3. Here there is no attempt to get spring suspension. Quite frequently the yoke over the motor nose has too little clearance to the nose, resulting in binding when wear develops in the truck parts. This may cause hot axle bearings. Fig. 4, or some variation of it, is a considerable improvement, but here again provision must be made to prevent overtightening of the bolts.

Fig. 5 shows a construction that is more satisfactory than Fig. 4, and easier to handle. There is no binding in any direction, and the set-up stress is determined by the spring design and the space allowed for the spring. The motor is built with a double nose, and there are four lugs on the transom as shown. The spring nest is held between two wearing plates. It is compressed by the two end bolts sufficiently to allow the assembly to be slipped between the noses, after which the tension is released. Guides bolted to the transom at the ends of the nest keep it centered and vertical.

With increased speed of equipment the order of the day, serious attention should be given to the provision of adequate spring suspension for the motors. It will pay in reduced maintenance, less flashing, less noise, and generally better all-around performance.

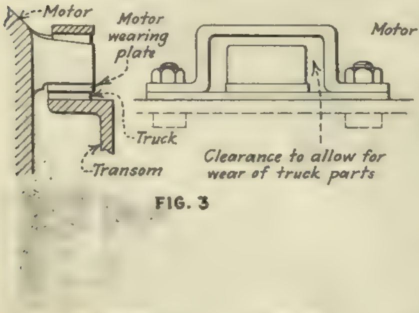


FIG. 3

Fig. 3—Suspension for large motors without spring support

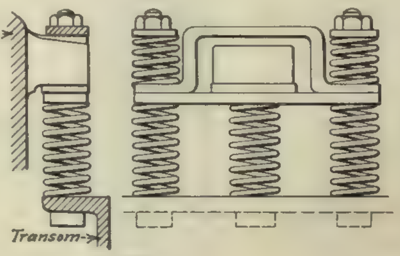


FIG. 4

Fig. 4—Suspension for large motors with springs

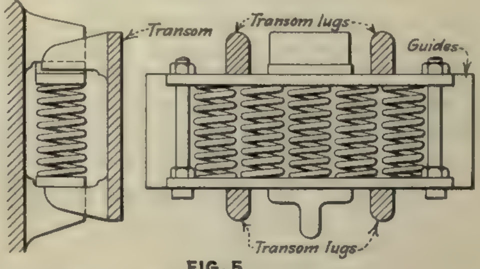
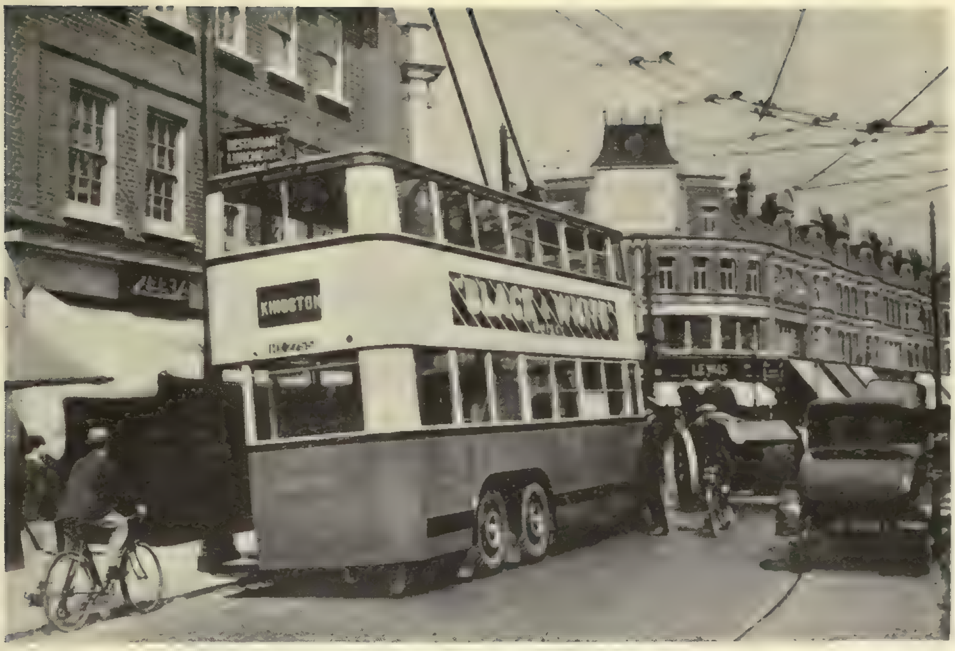


FIG. 5

Fig. 5—Flexible spring suspension for large motors with double nose and lugs on transom

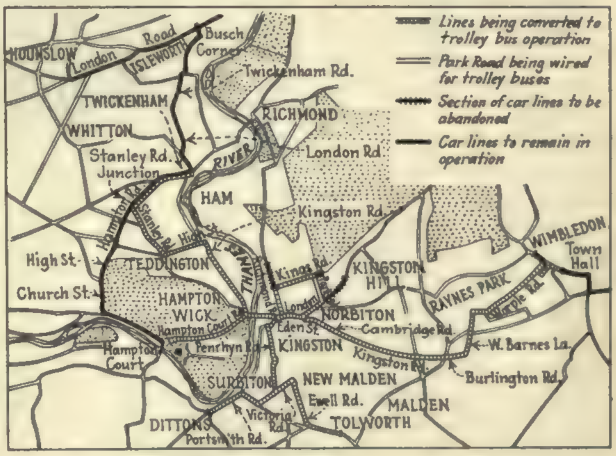


Sixty double-deck vehicles of this type are being placed in service by the London United Tramways

London Inaugurates Extensive Trolley Bus System

Sixty double-deck trolley buses in original order to serve about 17 miles of route. Advanced ideas in construction and equipment embodied in design of vehicles

TROLLEY buses were introduced to London on May 16, with the starting of service on the Twickenham Junction-Teddington section of the London United Tramways. Before the end of summer, about 17 miles of the system will have been converted to trolley bus operation and 60 vehicles will be in use. With a system of this magnitude and plans for expansion in the near future, London assumes a position of prominence among the cities with trolley bus service.



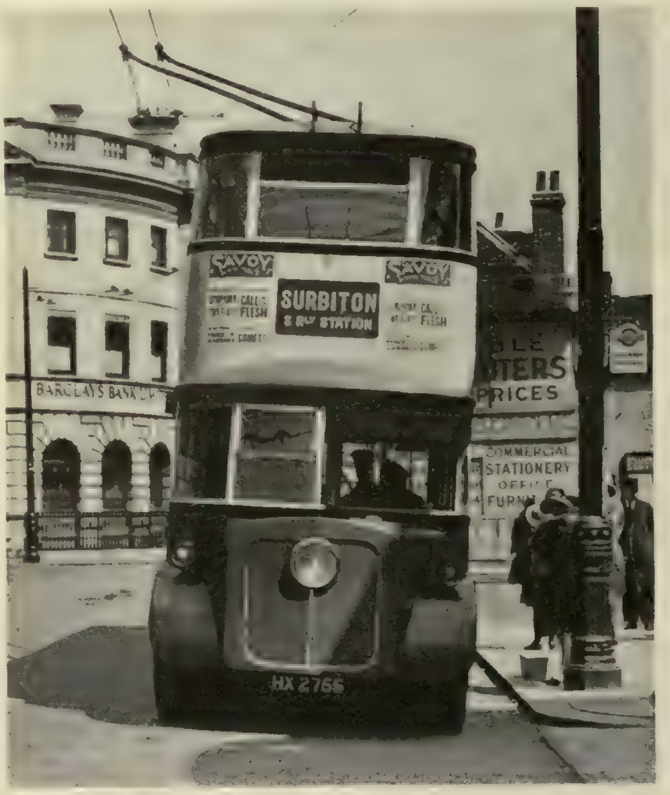
A large area of London will be served by trolley buses when all of the lines have been converted

As shown on the accompanying map, the lines comprise the entire routes operated by the L. U. T. in the Kingston, Surbiton, Malden and Wimbledon areas, as well as the Teddington-Hampton Wick section of the Hampton Court loop. At Wimbledon and Kingston certain short lengths of car routes, dead ends, will lapse from service. In the Kingston area the operation will be facilitated by stringing overhead along Park Road, a byway that connects the Richmond Park and Kingston Hill terminals. This will form a loop around which the vehicles from Dittons and Tolworth will operate in opposite directions. The two longest routes extend from Wimbledon Town Hall to Hampton Court, via Raynes Park, New Malden, Norbiton, Kingston and Hampton Wick, and from Twickenham Junction to Tolworth, via Teddington, Hampton Wick, Kingston and Surbiton.

A large proportion of the car track on the lines being converted is approaching the stage when renewal would be necessary. Also new rolling stock would be required soon. Traffic on these lines is not very dense, so that peak loads can be handled satisfactorily by the trolley bus. In determining the best plan of improvement, therefore, the Underground Company, which controls the L. U. T., decided that a conversion to trolley buses was the most advantageous proposition, from the viewpoints of economy and traffic efficiency.

The existing overhead construction is being modernized and supplemented by the necessary return wire on the Nottingham suspension principle, which comprises a system of span wires with central support. To insure a steady line voltage, an automatic mercury vapor substation is being installed at Malden. A constant voltage is important, as the electric motor, although nominally of 80 hp., develops 150 hp. at starting.

The 60 vehicles being built are the double-deck type and seat 56 passengers. Chassis are the model 663-T of the Associated Equipment Company, bodies are by the Union Construction and Finance Company, and the electrical equipment is by the English Electric Company and the British Thomson-Houston Company, the former furnishing 35 buses and the latter 25. Completely equipped, the new vehicle weighs 16,400 lb. Its over-all length is 27 ft. 7½ in.; its maximum width 7 ft. 5½ in.; the height from ground over roof sheets 14 ft. $3\frac{11}{16}$ in., and the wheelbase, 16 ft. 6 in.



A special form of hood gives improved balance and proportion. These vehicles seat a total of 56 passengers

Incorporated in the design of these vehicles are many new features. Fifty-four of the vehicles will be fitted with a special form of hood, designed to give improved balance and proportion to the lines of the front. This hood will have a headlight of the tilting type. A further departure is a new type of spring bumper for the left rear corner, designed so that it does not increase the over-all length.

Fully loaded the trolley bus is capable of a speed of 29.4 m.p.h. on the level and 18 m.p.h. on a 5 per cent grade. Acceleration is up to 2 m.p.h.p.s. Deceleration can be effected at approximately 5½ m.p.h.p.s. for ordinary stops and at more than 8 m.p.h.p.s. for emergency stops, these rates being uniformly continued until the vehicle comes to rest. The emergency deceleration enables a trolley bus that is running at 30 m.p.h. to be brought to a standstill in about 80 ft. The average scheduled speed, including stops, is from 10 to 12 m.p.h.

Built of nickel steel channel-shaped pressings, with a maximum depth of 11½ in., the chassis frame is exceptionally rigid, and the large over-all width makes for great stability. It is downswept over the front and the rear axles, which permits a body with a low floor level to be mounted. The cross-members are of tubular section.

The front axle is of substantial design and has extra large roller bearings. The kingpin, fitted with a special roller thrust bearing to eliminate friction, is so designed as to reduce steering effort to a minimum. Easy control is effected further by a light type of steering gear. A special type of front wheel brake, operated through a push rod in the kingpin, prevents the brake adjustment being disturbed by the steering lock. Hydraulic shock absorbers are supplied.

Simplicity of the rear truck design is promoted by the adoption of a single road spring on each side, instead of the usual four-spring arrangement. The two rear axles are one-piece nickel steel forgings, and the worm casing provides a large oil capacity. Worm gearing and bevel type differentials can be quickly detached from the casings. A third differential is fitted to the intermediate axle, thus assuring the equal division of power between the two axles. Another noteworthy feature is the torque blade, of chrome vanadium spring steel, which permits complete freedom of motion of each axle and obviates extreme angles on intermediate propeller shaft couplings.

With the exception of the resistances, all of the single motor equipment is mounted at the front. The DK-130 English Electric and the 110-DL British Thomson-Houston box frame self-ventilating motors have normal ratings of 80 and 82 hp., respectively. In each type the armature is mounted on roller bearings and is easy to remove, while the motor as a unit can be lifted out through the front of the hood.

Movement of the master controller is effected by a pedal. The six-notch English Electric controller is of drum type and works the contactors in conjunction with a current limit relay, which is automatic after the first two notches. The fifth and sixth notches are "running" notches, the fifth giving full field and the sixth a weakened field. The nine-notch Thomson-Houston controller is of a new type, the spring contact fingers, of silver, being mounted on an insulated bar and the contacts on an insulated base. It is under the control of the driver throughout the entire range of operation. The eighth and ninth notches are "running" notches. A special device necessitates the direct action of the driver to use field shunting.

Current collection is through two 20-ft. trolley poles, allowing the vehicle a maximum deviation of 13 ft. from the center line. A bamboo trolley retriever is carried in a sheath under the body. Attached to the chassis is a skate, operated by a change-over switch. Through contact with the track rail this enables the trolley bus to be maneuvered on car track where there is no overhead return wire.

Internal expanding brakes, with detachable liners working on pressed-steel drums, are fitted to all six wheels. Brakes of the four rear wheels can be set by means of a hand lever, this method being used chiefly for parking. Application of the brakes to all six wheels is by pedal, amplified by the Dewrandre Servo vacuum system. The vacuum is obtained by a Reavell rotary exhauster. Rheostatic braking also is used on the vehicles. The reverse impulse from this method causes sufficient retardation to reduce the speed from 20 m.p.h. to about 8 m.p.h. or less, without wear on the brake drums. All forms of braking are controlled by the same pedal, the four depressions being as follows: (1) The current is cut off from the motor; (2) the rheostatic brake is applied; (3) the rheostatic brake is further applied, and (4) the wheel brakes are actuated with Servo amplification.

Floor bearers of the lower deck form a framework made up of strong aluminum alloy sections over the rear axles and of teak elsewhere. Framings of the two saloons are independent units bolted together, the joints at pillars being reinforced by aluminum alloy gussets screwed to the framing. The staircase is built into this framing. Upper floor bearers, which form the carlines of the lower deck ceilings, are specially shaped steel pressings. The roof is of 18-gage aluminum sheet, screwed to the wood carlines, except at the trolley base, where it is 14-gage strong aluminum alloy sheet, riveted to the steel carlines. The sheets are doped and covered with cotton duck. All siding and end sheeting is of 16-gage aluminum, screwed to the framework.

Accommodations for 24 passengers are provided in the lower deck, with eight two-person cross seats, one two-person longitudinal seat under the staircase and a six-passenger longitudinal seat facing the staircase. In the upper deck are seats for 32 passengers, thirteen two-person cross seats and a six-person seat across the rear end.

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American Executive Committee Meets at Quebec

COINCIDENT with the convention of the Canadian Electric Railway Association, a meeting of the American Executive Committee was held at Quebec on June 11. Satisfactory progress with plans for the various phases of the convention to be held at Atlantic City in September was reported by the chairmen of several committees. Brief reports concerning other current activities of the Association were presented. Full authority was given to the Engineering Association to act in connection with the proposed revision of the constitution of the American Standards Association. Resolutions were passed expressing the regret of the Association at the death of Joseph R. Ellicott, Fred Green and Harlow Clark. To fill the vacancy in the position of National Counsellor of the United States Chamber of Commerce created by the election of J. N. Shannahan to be a director, the committee appointed Lucius S. Storrs. It was decided to hold the next meeting of the Executive Committee on July 24 at New York City.

On the day following the meeting of the Executive Committee, conferences were held both morning and afternoon under the auspices of the Advisory Council. These meetings were attended by electric railway executives of the New England States, as well as representatives of a number of Canadian properties. No fixed program was followed, the discussion being entirely informal concerning various problems now facing the industry.

Reading Heats Control Building with Off-Peak Energy

ELECTRIFICATION of railroad lines around and between metropolitan centers demands electricity in large quantities for motive power. The energy for the railroads is, in some instances, generated in independent plants, but in most large projects now under way, it is supplied by the electric light and power companies. This supply of large quantities of electric energy is bought quite generally, under contracts having certain demand charges, coupled with a reasonable charge for energy. The load demands are, of course, established by the traction necessities. There becomes available, therefore, electricity which can be used for various purposes, provided its use is confined to the off-peak or off-demand hours. This has led to the installation of automatic thermal storage off-peak heating systems for various purposes along the right-of-way. The usage of electrical energy can automatically be so confined to certain hours that the load is not superimposed upon the traction peaks.

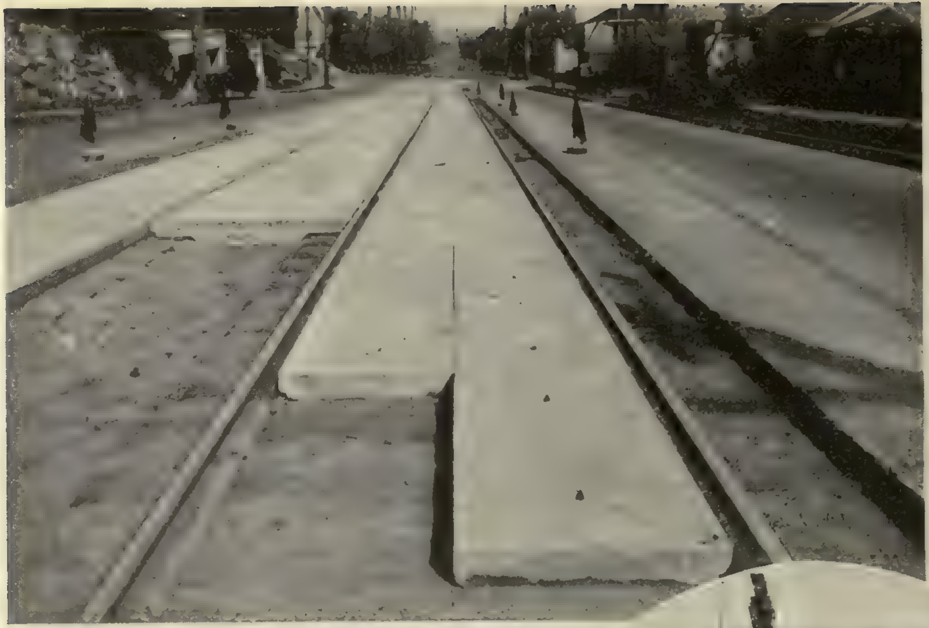
Among the first railroads to realize the merits of this form of heating is the Reading Company. This company has installed in its main control building, just outside the Philadelphia Terminal, an "off-peak" or "off-demand" electric heating plant which uses electricity at a low energy cost free from demand charges.

The building, approximately 30x30x25 ft., consists of two floors, the upper one containing the main control table and the lower floor being used as one of the automatic substations for the local division. The railway equipment occupies the remaining space, so that the automatic electric heating plant and an automatic electric water heater for utility purposes made by the Hall Electric Company of Philadelphia were installed in a waterproof pit alongside the building. A duct is run into the main building carrying the two heating lines, the water supply lines and the necessary cable. The space heated is approximately 17,500 cu.ft. The automatic substation on the lower floor is heated to a temperature of 50 deg., whereas the operating room is maintained at 70 deg. With the "off-peak" automatic heating plant the temperatures required on the two floors were obtained more readily than could have been done with other forms of heating.

The building is uninsulated except for 1-in. Celotex in the ceiling. The walls are of 13-in. brick, with the first and second floors and ceiling of concrete. One item which somewhat influences the consumption is the large amount of exposed glass installed so that the operator can see the surrounding trackage from the windows of the tower.

The heat loss from the control building, based on the temperatures given, was found to be 17,000 B.t.u. per degree-hour. To store sufficient heat units, it was found that a 500-gal. storage tank, equipped with 40 kw. of heaters, when controlled by an electric time switch to prevent using energy during the peak periods, would deliver the desired capacity under the most exacting conditions. Based on the radiation factor of the building, for a normal heating season the total consumption of electrical energy will amount to 49,950 kw.-hr.

The heating system, being entirely automatic, imposes no burden for its operation on the power dispatcher, whose normal responsibilities require his constant and undivided attention.



Precast concrete slabs of this type have proved to be an economical way of paving the street railway track area at Seattle

Slabs are delivered and placed in position by a small motor truck with derrick equipment

Precast Concrete Slabs for Temporary Paving

By A. E. Pierce

Assistant Superintendent
Seattle Municipal Street Railway
Seattle, Wash.

DEVELOPMENT by the Seattle Municipal Street Railway of a precast reinforced-concrete paving slab for unpaved track has solved a difficult problem. Extensive installations of these slabs are being made at the present time. They were first designed in 1926 for use at a street intersection where heavy automobile, truck and bus traffic was causing frequent demands for the replacement of the wooden planking being used. A local concrete company furnished slabs for experimental purposes. They are still in service giving entire satisfaction.

The city's policy for a number of years has been to relieve the street railway of the original surface paving cost, except the additional expense due to the presence of tracks. The financial condition of the railway in recent years has prevented its paying even this small extra cost and several miles of track have remained unpaved. If precast reinforced-concrete slabs could be manufactured and installed at approximately the same price as plain concrete of from 7 in. to 8 in. in depth, it was thought that it would allow the abutting property owners and the city to install the slabs in the street railway tracks without involving the street railway department in any expense other than a slight surfacing cost.

The cost is approximately $6 per lineal foot for the area 18 ft. wide occupied by the double-track car line. The slabs are of reinforced concrete, 4½ in. thick and of varying lengths and widths, resting upon the ties. The slabs between the rails and between the rail and concrete paving are placed parallel with the rails, while the slab for the "dummy" is of a heavier design and is placed at right angles to the track and rests on the projecting ties from either track. The slabs are manufactured and cured in the yards of a local concrete products firm and are transported to the job and placed by a derrick, as shown in the accompanying illustration. A wooden filler along the inside of the rail is used to space the slabs in the track and to allow for wheel flanges.

There is some rocking movement in the slabs, but a fine sand is being swept into the joints which stops this. Slabs are built in units of a weight which allows their removal by men in the maintenance crew whenever repairs to the track or roadbed may be necessary. In case the street railway later may be in a financial condition to install standard paving, the slabs can be removed and installed in another location.

Faster, Better Service Needed

Plans for improvement of transportation methods were discussed at the Quebec convention of the Canadian Electric Railway Association. Improvement in schedule speeds and methods of bus maintenance were topics of principal papers

NEED for the adoption of a new viewpoint was the message the delegates heard at the 27th annual convention of the Canadian Electric Railway Association, held at the Chateau Frontenac, Quebec, on June 10-12. Speakers, committee reports and discussions from the floor all stressed the fact that the industry no longer can dictate to the public what service it will deliver, but must now take orders from the same public as to what service will be acceptable.

Since there were no exhibits, sessions were held both morning and afternoon. The usual custom of having addresses by prominent speakers at luncheons on each day, however, was retained.

Entertainment features included a dinner at the Chateau Frontenac, a golf tournament and an informal dinner at Kent House, and various trips to points of interest in and around Quebec.

In his presidential address, Mr. Tait called attention to the substantial manner in which revenues of Canadian electric railways have held up in view of the business situation. The year 1930 was the second highest in history, being exceeded only by the preceding year.

On each of the three days of the convention a luncheon was held at the Chateau Frontenac, at which President Tait was toastmaster. On Tuesday, following a welcome to the city of Quebec by Mayor H. E. Lavigeur, Carl W. Stocks, editor *Bus Transportation,* spoke of the development of unified control of urban and interurban bus lines radiating from a central city. One management should control all operations, although separate companies may be formed for the city and interurban services, on account of the non-interchangeability of equipment and drivers. Maintenance, however, should be consolidated. Mr. Stocks concluded with sixteen recommendations for improving bus service and increasing profits.

Lucius S. Storrs, Baltimore, speaker at the luncheon on Thursday, laid particular stress on the necessity for getting away from the old ideas of publicity. It may be summed up in two propositions, he said: whether we are doing things *for* the public or doing things *to* the public. He believes that we must forget the time-honored term "good public relations," and instead cultivate a friendly public interest.

J. H. Hanna, Washington, D. C., president American Electric Railway Association, speaking at the Friday luncheon, stressed the necessity for improved service in view of the intense competition of today. Apart from this, it is the duty of the industry to furnish the highest possible form of transportation service. The presence of many private automobiles in the streets means more than keen competition; the traffic congestion created by them surpasses in importance any other public problem. The arteries of travel must be cleared of obstruction; to do this, public vehicles must be given such preference in the handling of traffic as is justified by their much higher efficiency in the use of streets. But managements must realize that their service is not now satisfactory and they must bring about such improvements as will remove the prejudice which now undoubtedly exists against the use of their vehicles. These things accomplished, there will be a greater demand than ever for public transportation.

The Tuesday morning session was devoted to reports of committees. The Bus and Coach Committee report, presented by its chairman, D. E. Blair, of Montreal, gave a résumé of progress with the Diesel engine for motor buses. Development of this engine has been so rapid, during the past year of two, that it is reasonably certain that highly satisfactory units will be available in a competitive market and in a relatively short time. The committee also called attention to the merits of the trolley bus, especially for smaller cities.

W. F. Irvin, Toronto, presented the report of the Committee on Traffic Control. A summary was given of results with traffic signals. From this the inference was drawn that signals are of greatest utility where traffic is very heavy. For lighter traffic, stop signs, slow signs, flashing beacons, and other devices of a permanent nature are to be preferred.

In the discussion, Mr. Blair pointed out the difficulty of timing signals so as to obviate delay where streets are uneven or block lengths not uniform. W. R. Robertson, Hydro-Electric Railways, believes in manual control in such instances or where there are varying amounts of traffic on intersecting thoroughfares. H. C. Patten, Toronto, holds that street railway men have been too content to leave traffic control to city governments, which are interested chiefly in facilitating automobile movements, whereas the street car carries perhaps 80 per cent of the people on street car streets. E. C. Schoales, Fort William, believes that in small cities there is a tendency to install too many signals.

C. H. Clancy, Toronto, reporting for the Committee on Merchandising Transportation, in the absence of the chairman, J. Lightbody, pointed out that the public must be informed of the facts relative to the merits of various transportation methods. Street railways should indicate to the public their willingness to adopt new forms, such as the motor bus, as quickly as they are proved suitable, and can be worked into the transportation system. The committee suggests that the designation "street railway system" should be discarded gradually in favor of a broader term which would include motor bus and perhaps taxicab operation. The need for sales methods, and the possibilities of employing a sales manager, particularly in the larger companies, also was considered.

K. B. Thornton, Montreal, discussing the report, stated that there is no question in the mind of any transportation man that it is best to co-ordinate the various methods where there is a demand, else there will be competition. J. B. Hayes, Halifax, feels that the benefit of giving various types of transportation is that it makes the public realize that the company is doing its best to furnish service. Mr. Robertson has made use of various unusual means of publicity. As a result, the public is becoming more interested in transportation systems. C. H. Dahl, Winnipeg, has obtained good results from a company paper, published twice a month.

H. E. Weyman, Levis, presented the report of the Committee on Safety and Accident Prevention in the absence of A. E. Parker, Winnipeg. The committee notes that the Canadian companies continue to show improvement in results of accident prevention.

Two principal papers were presented at the regular sessions of the convention. The first was by Joe R. Ong, director of research Cincinnati Street Railway, whose subject was the improvement of schedule speeds. Speed, he held, is the keynote of success of a transportation system. The former claim that the street car is the fastest vehicle on the street has been challenged everywhere. Accordingly, the highest possible speed consistent with safety is necessary if the street railways are to regain the business which they have lost, or to hold and add to the business which they now enjoy. Whatever the physical conditions which it would be difficult to change, it would appear the reasonable and clear duty of the schedule department to put into effect and operate schedules for the highest possible speed consistent with them. Besides the actual speed, an element of appeal necessary to hold the business and to increase it is to create the impression of speed. In detail, Mr. Ong listed many methods by means of which these results may be attained.

Following Mr. Ong's paper, additional emphasis was laid on several of the points stressed by him. J. Metcalf, Toronto, believed that speed is uppermost in our business, but that it has been given serious consideration only in the last two or three years. Charles Gordon, managing director A.E.R.A., held that speed, frequency and regularity are essentials of successful service. Morris Buck, ELECTRIC RAILWAY JOURNAL, pointed out that many of Mr. Ong's recommendations can be carried out without any major expenditure, and that the improvement in operations obtainable in that manner may so benefit the property that money for major projects will be forthcoming. C. H. Dahl, Winnipeg, agreed that while a reduction made in running time may be very small, the riders get the impression that a far greater time has been saved. R. M. Reade, Quebec, believes that the personal element on the part of the men is essential to making improvements in speed. Mr. Schoales concurred in this, and also pointed out that the men have more at stake than anyone else connected with the organization.

Motor bus servicing and maintenance was the subject of the second paper, presented by C. O. Sparhawk, superintendent bus mechanical department United Electric Railways, Providence, R. I. Methods employed in modernizing and expanding the bus repair work of his property resulted in an improvement of the morale, clean and well-painted buses on the highway, less need for spare bus equipment, more miles per pull-in, and reduction in maintenance costs amounting to 23 per cent. The discussion following Mr. Sparhawk's paper centered on the desirability of continuing buses with the design as received from the manufacturer or changing them to meet certain needs. P. H. Reid, Montreal, believes that changes should be made when necessary, and that maintenance costs will be reduced thereby. Mr. Blair held that defective design should be gone into carefully with the idea of improvement. Mr. Tait stated that he has found the manufacturers liberal in replacing parts that do not meet the requirements.

Besides the principal papers, a considerable part of the program was devoted to the consideration of topics of interest to operating men. These included a wide range of subjects. Comparison of sliding collectors and trolley wheels attracted considerable attention. L. R. Wagner, Detroit, stated that after extensive tests, the Detroit Department of Street Railways has adopted sliding collectors for use throughout on its system. There has been a reduction of 50 per cent in trolley wire wear and a net saving of about $20,000 a year. L. E. Gould, Economy Electric Devices Company, also pointed out the advantages of shoes over wheels. E. B. Walker, Canadian National Railways, thinks that improvements in wheels may come.

Relations between trolley wheel or shoe pressure, friction, and current capacity at various speeds were discussed by L. W. Birch, Ohio Brass Company. He pointed out the need of maintaining the correct proportions between the various elements in order to get satisfactory performance. He also indicated that by increasing the diameter of the trolley wheel axle, properly lubricated, the life can be increased materially.

Results of wood preservation was another topic considered. H. Wykes, Hydro-Electric Railways, believes that there is no excuse for the use of any untreated ties today. With creosote, the life can be extended so greatly, even with soft wood, that it does not pay to install untreated ties. G. A. Berry, Canada Creosoting Company, followed with additional evidence as to the value of treatment. Mr. Robertson referred to the use of wood shims laid between the tie and the rail to take the mechanical wear and so increase the life of the tie. A. V. Linnell, Montreal, told of untreated ties which have had a life of 25 years, outwearing the rail. These were swamp cedar, which is the best rot-resisting wood grown in Canada. Don M. Campbell, Preston, pointed out that the quality of the tie depends as much on the soil and the climate as it does on the variety of wood.

Methods of car and bus painting were discussed under the leadership of W. R. Robertson, Hydro-Electric Railways, and F. S. Beattie, Ottawa Car Manufacturing Company. Others taking part in the discussion were W. R. McRae, Toronto, and Don M. Campbell, Preston.

D. E. Blair, Montreal, and J. Metcalf, Toronto, discussed methods of minimizing turnbacks, while W. C. Monk, Winnipeg, and A. S. McArthur, Toronto, told of the advantages and functions of road instructors.

Labert St. Clair of the American Electric Railway Association told the delegates that they should use the car or bus where each fits best.

Following the presentation of the report of the nominating committee by W. S. Hart, Three Rivers, officers for the ensuing year were elected unanimously, as follows:

Honorary president, J. E. Tanguay, general manager Quebec Railway, Light & Power Company.

Honorary vice-president, Acton Burrows, proprietor *Canadian Railway & Marine World*.

Honorary advisory council: T. Ahearn, Ottawa; E. Anderson, Winnipeg; J. E. Hutcheson, Montreal; W. A. Kingsland, Canadian National Railway; W. G. Murrin, Vancouver, and J. F. Saint-Cyr, Montreal Tramways Commission.

President, K. B. Thornton, general manager Montreal Tramways.

Vice-President, George E. Waller, manager Hamilton division Ontario Hydro-Electric Railways.

Treasurer, H. C. Patten, comptroller Toronto Transportation Commission.

Auditor, J. E. Richards, manager London & Port Stanley Railway.

Executive Committee: The president, the vice-president, the treasurer, the junior past president (L. Tait, London) and D. E. Blair, Montreal; F. D. Burpee, Ottawa; C. H. Dahl, Winnipeg; W. S. Hart, Three Rivers; D. W. Harvey, Toronto; J. B. Hayes, Halifax; W. J. Lynch, Quebec; H. R. Mallison, Montreal; W. R. Robertson, Windsor, and H. E. Weyman, Levis.

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Canadian Electric Railways Made Good Showing in 1930

ELECTRIC railway systems in Canada had their second most prosperous year in 1930, according to the yearbook of statistics of the Canadian association, prepared by the secretary, Eustace Smith, Jr., and distributed at the Quebec convention.

Due to industrial conditions passenger revenue fell off somewhat last year from the high mark of 1929. This loss in revenue varied, being more marked on the smaller properties. As to employment, the electric railway industry has proved during this period of depression to be one of the most stable industries in the Dominion. While reductions have been made in operating expenses there have been comparatively few reductions in staff.

Passenger revenue is given in the accompanying table, both total and per miles of single track, and the ratio of operating expenses to passenger revenue per mile of single track. The trend is set out by index numbers, with 1900 taken as 100. Passenger revenue per mile of single track is now 2.55 times as great as it was in 1900, but operating expenses per track-mile are 3.15 times as great. Despite the general depression, the passenger earnings in 1930 per mile of single track were the second highest in the history of the Canadian electric railway industry. This was offset to some extent by the highest operating expense per mile of track of any year to date, although the ratio of operating expenses to passenger revenue was lower than in 1928.

On a car-mile basis, there has been a general decline in operating expenses since 1921. The use of one-man cars and modernized equipment have been important factors in that movement.

Considering the distribution of the revenues, a chart shows that in 1929 operating expenses took 61.93 per cent of the revenue. The remainder was distributed as follows: Taxes, 3.54 per cent; deductions from income, 27.51 per cent, and net income, 7.02 per cent. In 1929, 34.53 per cent of the total revenue was available for capital reserves and to pay investors, as against 33.33 per cent in 1928 and 32.96 per cent in 1927.

Revenues and Expenses of Canadian Electric Railways per Mile of Track, 1900-1930

	Passenger Revenue			Operating Expenses		
Year	Total	Per Mile Single Track	Trend	Per Mile Single Track	Trend	Operating Ratio Per Cent
1900	$5,529,687	$8,192	100	$5,237	100	63.93
1905	8,932,914	11,265	138	7,463	141	66.25
1910	16,125,994	11,660	143	7,319	140	62.77
1915	25,579,689	12,211	150	8,622	165	70.61
1920	43,279,009	17,832	218	15,757	300	88.36
1925	45,185,402	17,616	216	13,811	264	78.40
1926	46,810,403	18,516	227	14,414	275	77.84
1927	48,289,774	19,521	239	15,046	286	77.07
1928	50,164,164	20,050	244	16,438	314	81.98
1929	52,302,474	21,107	258	16,102	307	76.29
1930	49,194,375	20,827	255	16,516	315	79.19

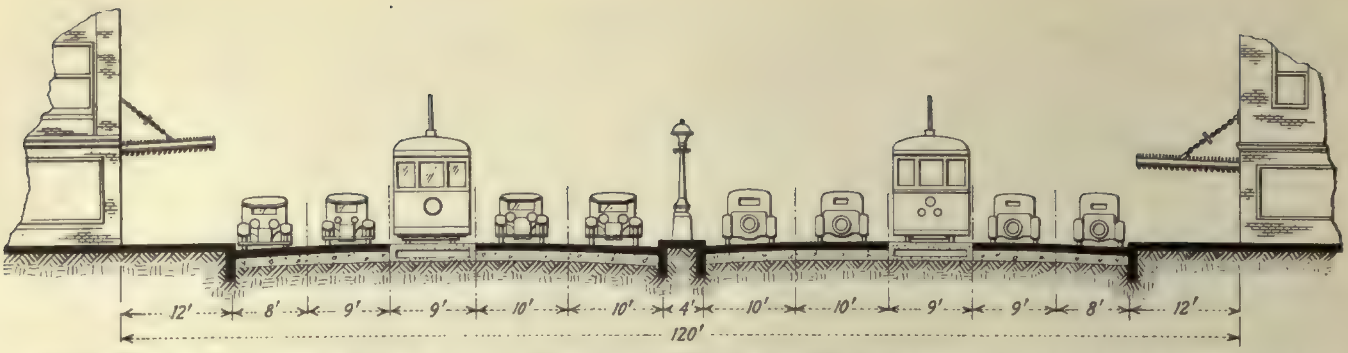
Since 1922 fares and wages have continued to increase slightly, the major change occurring prior to that year. In 1928 and 1929 wages took a distinct upward trend, and in 1930 reached the highest point so far, being 99.4 per cent above 1913. There have been few changes in city fare since 1925. The cost of living outran wages until 1920, when the former reached its peak at 83.1 per cent higher than in 1913. In 1921 the cost of living dropped back to 53.3 per cent over 1913 and continued at much the same level until 1930, when it experienced a very pronounced drop to the lowest point since the war, at 45.9 per cent above 1913. In 1930, fares were still only 51 per cent higher than 1913, whereas cost of living shown on the chart was 45.9 higher. Wages in 1930 were 99.4 per cent higher than 1913, or nearly 1 per cent higher than 1929. On the 1913 base, wages have increased 11.6 per cent in the last five years, or a straight increase of over 6 per cent when the last five years are compared separately. Living costs in the same five years have decreased a straight 5 per cent.

The number of revenue passengers continued approximately the same from 1913 to 1918, averaging 595,000,000. From that date the number increased until a peak was reached in 1920, when 804,711,333 passengers were carried, or 35.2 per cent over 1918. In 1921 there was a decrease of 10.6 per cent. From 1921 to 1925 the number of revenue passengers carried showed little if any change. In 1926 an improvement was shown, with 748,710,836, an increase of 3.2 per cent. In 1927 a still greater improvement was shown, 781,398,194 revenue passengers being carried, an increase of 4.5 per cent. In 1928 revenue passengers reached 808,023,615, or slightly in excess of the peak of 1920. In 1929, however, 836,729,851 revenue passengers were carried, an increase of 4 per cent over the 1920 peak, and greatest number carried in the history of the industry in Canada. In 1930 there was a decrease of 6.1 per cent to 785,897,801 revenue passengers.

Another chart shows the steady increase in the investment in electric railways in Canada which has taken place since 1901. In that year, only $40,553,170 was invested, which grew to $240,110,655 in 1929, an increase of $9,416,397 over 1928. In 1930, the total invested was $247,761,974, an increase of $7,651,319 over 1929. Receiverships or supersession of electric railway services by motor bus service are comparatively rare.

The most recent figures available show the net income as reported by companies in 1929 of $4,541,376 as against $2,920,124 in 1928; $3,229,943 in 1927, and $2,361,750 in 1926.

Remarkable development of the motor bus and coach industry in Canadian transportation is shown on another chart. From thirteen buses operated by electric railways in Canada in 1913, the total has grown to 616 in 1930. The growth is particularly marked during the past five years. In 1930, the number of coaches increased 12 per cent, and the number of feeder buses 16 per cent. During the past three years electric railways have purchased the larger and more important independent bus lines, directly or indirectly in competition.



Proposed redistribution of street space on 120-ft. street in Detroit to permit easy access to street cars, and give through traffic an opportunity to move without interruption in the center of the roadway

Redistribution of Street Space Proposed at Detroit

FOR the past six years, the process of revising the street system of the city of Detroit to bring it up to modern requirements has been under way in accordance with a master plan. Some 25 miles of major thoroughfares, 120 ft. wide, have been created within the city limits. Where these streets are occupied by main routes of the Department of Street Railways, it was necessary to readjust the tracks, and a question arose whether they should be placed in the center of the street in accordance with traditional practice, or in some other location.

Prior to final action affecting the widened section of Gratiot Avenue, a diagonal thoroughfare of great traffic importance, a study of methods of utilizing the wider street space was made by representatives of the Street Railway Commission, the Rapid Transit Commission, the Department of Public Works, the Police Department and the City Plan Commission.

In their report to the Council these representatives recommended that the street car tracks be placed in the third lane from each curb, with two lanes of traffic moving in the same direction as the street cars on each side of the track. Between the street car and the curb, one lane would be for loading and unloading, and the other for local traffic. Between the car track and the center of the street there would be two lanes for fast moving through traffic. A safety island in the center of the roadway would offer a midstreet refuge, and also serve to separate traffic moving in opposite directions. The division of street space for the various uses is shown in detail in the accompanying illustration.

The committee expressed the opinion that this arrangement preserves all the rights now possessed by persons and property in the use of the street surface and adds materially to the safety and convenience of pedestrians and car riders.

The project was discussed at three public hearings. The recommendation of the five city departments was opposed by representatives of the Gratiot Avenue Improvement Association, and the Council finally directed the Department of Street Railways to put the tracks in the center of the street. The defeat of this project, however, is not regarded by the city departments supporting it, as affecting its intrinsic merits. They argue that the increased safety to pedestrian and car rider, and the greater fluidity offered to motor traffic are advantages that will become increasingly more necessary with the increase in density of traffic. In their opinion, the arrangement offers the best and most economical means for reducing the hazard to the car rider whose position is daily becoming more precarious and will become even more dangerous with the car tracks in the center of the wider street.

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Lackawanna Railroad Electric Equipment Gives Excellent Performance

DURING the month of May, 1931, motor cars operating the electrified suburban service of the Delaware, Lackawanna & Western Railroad out of the terminal at Hoboken, N. J., ran a total of 358,196 miles. During this time, there was one failure which resulted in a pull-in. This gives a record of 358,196 motor car-miles per pull-in, which is remarkable even in these days of excellent maintenance.

Frankfort Experimenting with Diesel Buses

Street railways in Frankfort-on-the-Main, Germany, are carrying on experiments on Diesel buses with trailers. Fuel cost has been reduced from 0.75 to 0.12 pfenning per seat-kilometer through trailer use. Without trailer, the cost of fuel is 0.22 pfenning

Conference Instruction

Successful in St. Louis

Courses in accident prevention, salesmanship and equipment covered by 25.2 per cent of trainmen in six-month period. Attendance is voluntary. Location and time of holding classes important factors

THREE courses of instruction for the trainmen of the St. Louis Public Service Company, dealing with the subjects of accident prevention, salesmanship and equipment, were inaugurated on Nov. 3, 1930. Each course is given in six regularly scheduled weekly periods, is elective and voluntary on the part of the employees, and classes are held at convenient points and hours to foster regular attendance. The courses in accident prevention and salesmanship are conducted largely on the conference basis with the idea of drawing on the experience of the group of men for the content. The equipment course is designed to give the men more thorough knowledge and practical acquaintance with their equipment, particularly the controller, brakes, air valves and electric circuits.

The accident-prevention conferences are conducted by selecting a number of typical accidents, analyzing them and breaking them down so as to bring out the faulty points in the elements of alertness, judgment, and operating practices which caused them. Conversely, discussions of what should have been done to prevent them are carefully directed by the instructors. Examples selected include car collisions, motor vehicle collisions, pedestrian collisions, falls and door accidents. The final conference is devoted to a summing up of the discussions held during the previous classes together with a complete outline of the requirements for safe and efficient operation under the general headings of alertness, judgment, skill, co-operation with conductor, sound attitude of mind and physical health.

The salesmanship conferences, outlined principally for the instruction of conductors, bring out the following pertinent factors:

1. Introduction and analysis of the conductor's job.
2. The importance and methods of giving proper and adequate information to passengers.
3. The importance of courtesy, even voice and proper language in dealing with patrons.
4. The importance of taking a real interest in the patron.
5. The importance of personal appearance.
6. Teamwork between members of a crew.
7. Sales resistance to be overcome.
8. General summing up—What is a good conductor? Cases of poor handling of passengers in different situations are used largely as a basis for this discussion.

Because of the nature of the equipment course, it is carried on by the lecture and demonstration method. Equipment is studied in the following order:

1. Main circuit of power, from substation through feeder, trolley, main motor circuit, rail and return feeder to substation.
2. Main pieces of apparatus of the car, their purpose, their operation and their fundamental construction.
3. The air brake, its purpose, action and fundamental construction.
4. The line switch, door circuit control, train operation, etc.
5. Motor control circuits and the differences between various types of control.
6. The electric track switch, its principal parts and principles of operation.
7. Discussion on the abuse of equipment.

Car Equipped with Table and Blackboard Used as Classroom

It was realized from the beginning that the success of the courses, from the standpoint of attendance, depended largely on the location and time at which the classes were held. Consequently, a car was remodeled for the specific purpose of having a place to conduct the meetings. Several seats were removed in the front of the car and a table and blackboard were installed. The car was well painted, and additional lighting circuits and electric heaters were installed. This car is taken to a car station the same day each week for a period of six weeks. For the first series of classes, the men were asked to register for the course they would like to take and also for the hour that would be most convenient for them to attend. Classes were then arranged to suit the convenience of the greatest number. Experience during the first series of meetings, however, showed what time of day was the most convenient for the greatest number and subsequent series were scheduled for definite hours and only men who could attend at the time set were registered for the courses.

Attendance in any of these courses is entirely voluntary and on the trainman's own time. During the first series only the best men attended. In the subsequent series of meetings, however, a special effort was made to get those men out whose records were poor, or who seemed to need some additional instruction and suggestions for improving their work. As the accompanying table indicates, the attendance during the second series of conferences was better than at the first. This was due to the interest displayed by the superintendents at the various car stations in getting the men interested and reminding them of the day and time of their meeting.

Since a series of meetings lasts six weeks, the company considers a man as having a good record if he attends four of the six meetings in any one course. At the conclusion of each series the general manager sends a commendatory letter to each man who attends four meetings. This is the only thing that is done that can be considered in any way as an inducement to increase attendance. It will be noted that the attendance was much better sustained in the second series than in the first, the average in the first series being 14 men per meeting and in the second series 16.3. There were less meetings per day in the second series and the hours were more conveniently arranged. During the first series the company tried to have five or six classes a day, but found that at certain hours the meetings were poorly attended, so that now only four classes a day are held.

Attendance Data for Trainmen's Conferences, St. Louis Public Service Company

	Salesmanship		Accident Prevention		Equipment		Total	
Series.... Meeting	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1......	172	120	122	79	231	145	525	344
2......	94	102	89	80	180	121	363	303
3......	113	85	91	69	152	121	356	275
4......	28*	83	42*	78	71*	137	141	298
5......	71	73	69	61	117	136	257	270
6......	52	107	61	90	108	139	221	336
	530	570	474	457	859	799	1,863	1,826
Average per Meeting	13.2	17	12.2	15	15.4	17	14	16.3

Note—First and second series only are included.

*Thanksgiving holiday, pay days and run picking all fell in this week, causing attendance to fall.

In the first series 978 different men attended, of whom 159 were present for at least four meetings in one course. In the second series a total of 794 different men attended of whom 197 went to four meetings or more. A third series of classes has just been completed, in which 771 took part, bringing the total attendance for the three groups up to 2,567. Of the men taking the third series, 364 were present at four or more meetings. Therefore, in the three series, covering an elapsed time of more than six months, 720 men were considered to have completed one of the courses. The company has somewhat less than 3,000 trainmen, so that in fact 25.2 per cent of all these men attended the courses. A very large proportion of the men attended one or more meetings. Details of the third series of conferences are not yet completed, although it may be said that the results were even more satisfactory than those of the first two.

In addition to the instruction courses being given to the trainmen, which will be carried on in the fall, it is planned to institute similar courses to cover nearly all transportation department employees. Conferences with supervisory forces have already been held. Small groups meet once a week to discuss their jobs and the various problems connected with them. It is expected to get similar meetings under way with dispatchers and clerks within the very near future.

Awards for Reduction of Accidents

As an additional incentive for safety and careful operation on Jan. 1, 1930, the company put into effect a new system of awarding prizes to car stations. The year was divided into six two-month periods and an average number of accidents which each station had for each period in the last two years was taken. This average figure minus 10 per cent was set up as a bogey for each station. Any station which has a number of accidents equal to or less than the bogey wins a prize for that period. The amounts of the prizes vary according to size of stations, ranging from $225 down to $50. A no-report case counts as three accidents against the station. In making up the bogies the company included no-report claims on a three-for-one basis also. This system has each car station competing against its previous records, and not stations against each other. This arrangement makes it possible for any station to win six prizes in a year. The stations use their prize money for various purposes, most of them leaving it in a fund from which they make donations to employees at that station who have been sick and unable to work for some time.

Probably the most important feature of this prize system is the delivery of prizes to those stations winning them. An open meeting is held at the station and the general manager delivers the check. The directors of transportation and of safety usually make short talks. This gives the management an excellent opportunity for contact with the trainmen and also gives the officials a chance to explain company policies and problems.

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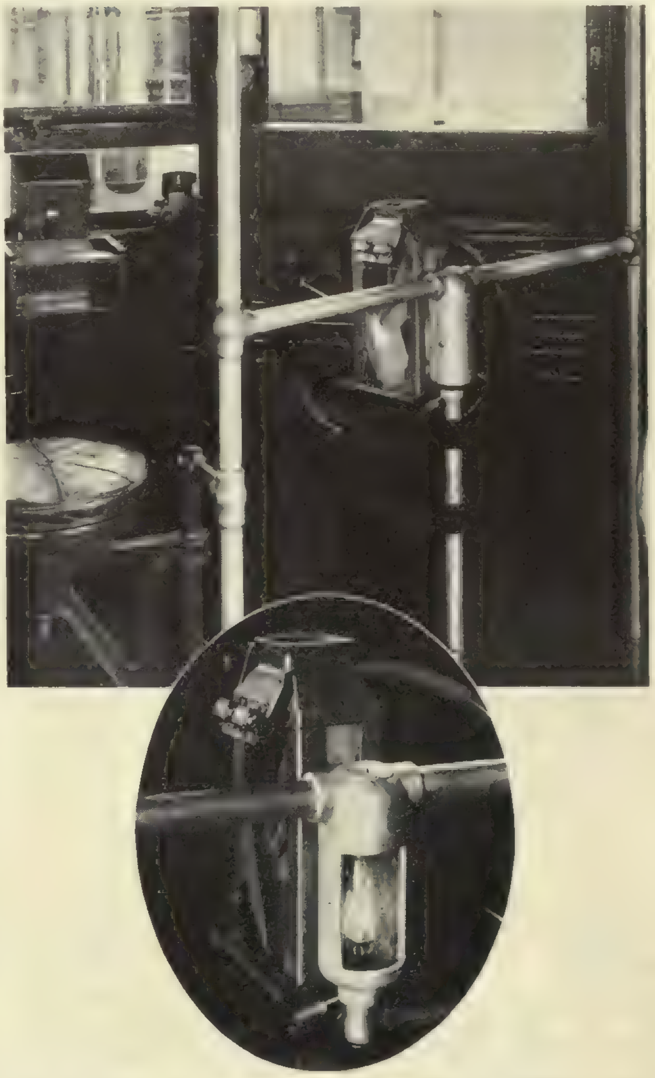
Electrification at 1,500 Volts D. C. in England

SPECIAL interest attaches to the electrification of the railway from Manchester (England) to Altrincham, because of the use of 1,500 volts direct current. The line, which is about 9 miles long, is owned jointly by the London, Midland & Scottish and the London & Northeastern railway companies, and has hitherto been operated with steam locomotives. It is the first passenger railway in England to be operated by direct current at this voltage. Other electric railways in England use 600 volts. As far back as 1915, however, operation at 1,500 volts was begun on the Shildon-Newport section of the London & Northeastern Railway in the north of England, a line used for the conveyance of coal from the mines to the seaports. Some time after that, a government-appointed committee recommended that future railway electrification should be carried out with the 1,500-volt d.c. system. In the recently published Weir Committee report, recommending the electrification of all the railways in Great Britain, the 1,500-volt d.c. system with overhead conductors is recommended. The Manchester-Altrincham line is the first British example of the method.

The power is supplied from two substations, one at Old Trafford and the other at Timperley. These get 11,000-volt three-phase current from the national "grid" system through the Stratford Electricity Board. A novelty about the Old Trafford substation is that in addition to rotary converters, one-third of the load is taken by a mercury-arc rectifier of 1,500-kw. capacity. This is the first mercury-arc rectifier to be installed for British railway service. The substation is manually operated and controls the Timperley substation with three rotary converters. The Midworth distant-repeater control is used, which is another novelty. Thus Timperley requires no direct manual operation.

Multiple-unit rolling stock is employed, with a motor coach and two trailers acting as a group. The cars are of the usual compartment type, first and third class. Each motor car has four series-wound motors, with each pair of the four permanently connected in series, so that each motor works on 750 volts. The design contemplates a train speed up to 70 m.p.h. The seating accommodation of a three-car train is for 228 third-class and 40 first-class passengers.

Ottawa Railway Illuminates Fare Boxes



The fare box on cars of the Ottawa Electric Railway is illuminated by a lamp placed in a housing on the supporting stanchion

HAVING experienced some trouble from passengers depositing improper tickets in the fare boxes at night, the Ottawa Electric Railway has developed a simple and effective means of illuminating the inspection plates to facilitate the examination of fares. On the cars of this company, the fare box is supported on a stanchion alongside of the operator. A lamp housing in the form of a T condulet was introduced at the junction of this stanchion and a horizontal hand rail. On one side, the housing has an opening through which the light shines into the fare box. The back of the housing is removable to permit convenient replacement of the lamp inside. Similarly, the top of the housing can be removed to permit replacement of the lamp socket. The lamp is connected in series with the lamps for the destination signs, the wiring extending through the hand rail. The lamp housing is entirely separate from the fare box and does not interfere with its removal whenever desired. All cars of the Ottawa Electric Railway are being equipped with this device.

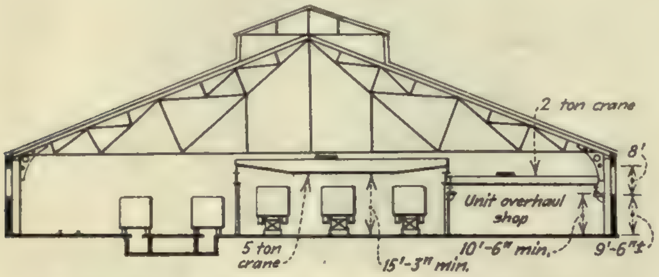
Award of BUS FRANCHISE Adds to *Brooklyn's*

Brooklyn Bus Corporation, a subsidiary of the B.-M.T., has been granted the right to operate on twenty routes totaling 73.85 miles. Management, operation and maintenance will be co-ordinated with the surface car lines. Maintenance plans outlined

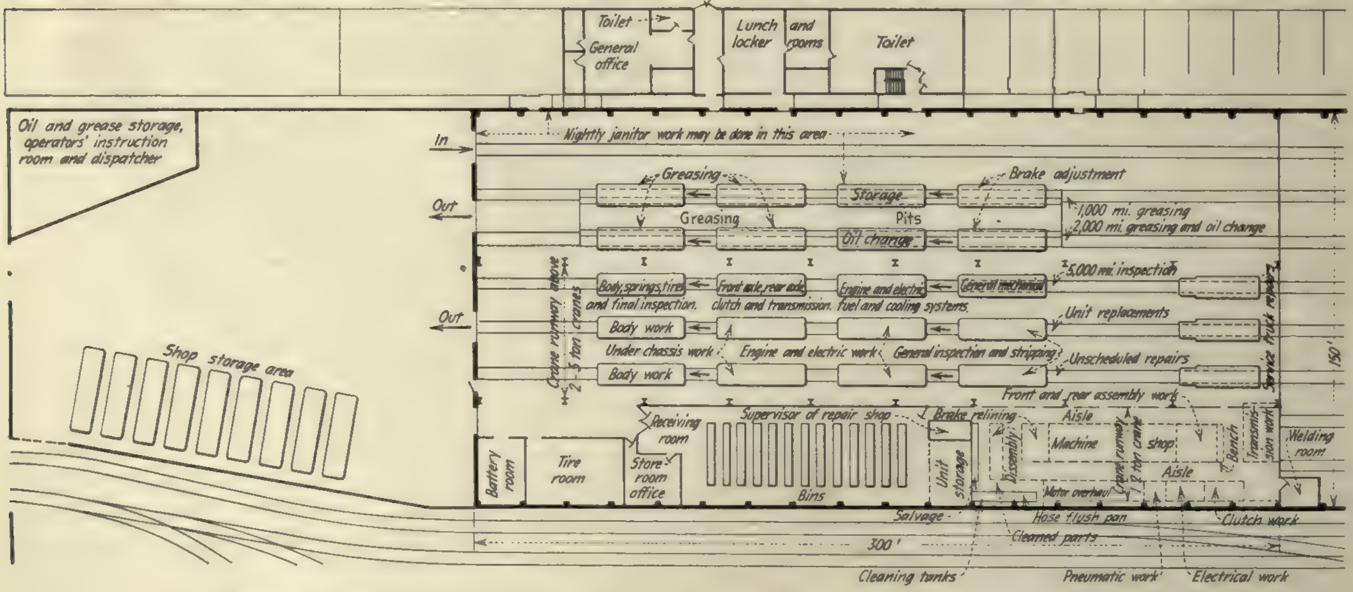
COMPREHENSIVE intraborough transportation service will soon become a reality in Brooklyn as a result of the award of a franchise by the City of New York to the Brooklyn Bus Corporation for the operation of buses along twenty routes. For more than a decade Brooklyn, now the largest borough of New York in population as well as in area, has lacked adequate and convenient crosstown service in the southern part of the borough. The rapid transit systems and the surface car lines have served the community effectively in the mass movement of passengers to and from Manhattan and the downtown section of Brooklyn; but the transportation facilities between the outlying sections, urgently needed for their growth and development, have not existed.

When people wished to travel from the eastern part of the borough to the western part they were compelled to go by a circuitous route. In every instance it was necessary to make several changes. Although a number of independent bus lines were operated under emergency permits from the city, they were inadequate and were laid out with little thought to their relation to the existing facilities. By granting the franchise to a subsidiary of the Brooklyn-Manhattan Transit Corporation, which operates 400 miles of rapid transit track and controls the 475 miles of surface line track of the Brooklyn & Queens Transit Corporation, the city is assured that dependable local transportation will be given, permitting travel from one section of Brooklyn to another by direct routes, and co-ordination with other forms of transportation. Adequate financial ability, operating experience and a guarantee of a fair return to the city were other important requirements that were satisfactorily met by the Brooklyn Bus Corporation.

The routes covered in the franchise were laid out after a careful study made by the Brooklyn Bus Corporation in co-operation with the Board of Transportation and municipal engineers. Several determining factors governed the final selection. These were: population, the

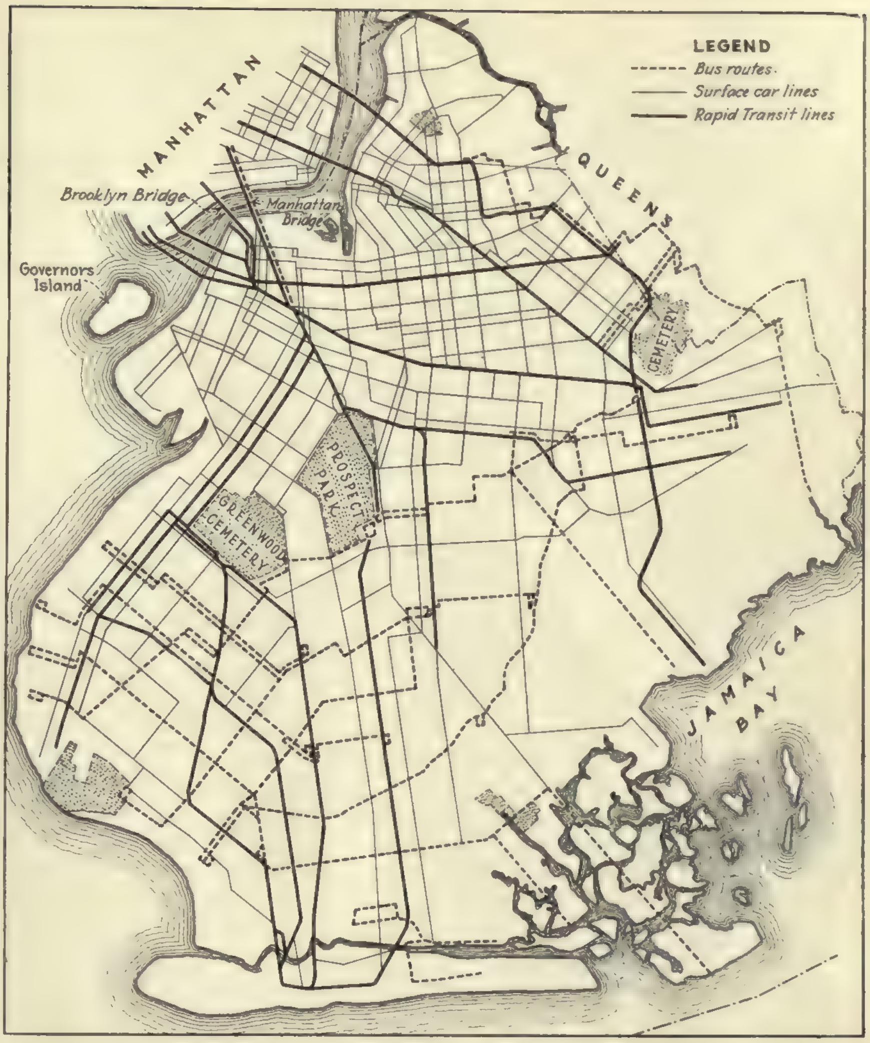


Five production lines will run the length of the shop



Proposed layout of new repair shop, designed for maintenance on a line production basis

Transportation Facilities



A new picture of Brooklyn's transportation facilities augmented with bus routes

type of neighborhood to be served; the trend of traffic, and possible connections with the surface lines. Of the twenty routes sixteen are entirely in Brooklyn, three are partly in Brooklyn and partly in Queens, and one route extends across the Manhattan Bridge and into Manhattan for a short distance. The three extensions into Queens were included because they are parts of important routes in Brooklyn that connect with surface lines of the Brooklyn & Queens Transit System.

As laid out the bus routes will permit numerous and convenient connections with surface lines, and a limited number with the rapid transit lines. An accompanying map shows this clearly. Between bus lines and surface lines there exist 52 transfer points and a total of 282 transfer privileges. Between individual bus lines there are sixteen transfer points and 76 transfer privileges. This close network of lines will serve the needs for direct route traveling between the outlying sections wherever such needs exist. In signifying their approval of the routes at the public hearings of the Transit Commission, engineers of the city stated that the routes were the best that could be obtained.

After all the bus routes have been in operation for a time sufficient for the public to become acquainted with them, it is believed that a certain amount of traffic will be found to have shifted from the surface lines to the bus lines. However, this decrease on the surface lines is not expected to be permanent, for the attractive service that can be rendered by the co-ordination of the two systems will undoubtedly increase riding, aid in the growth of the borough, and eventually lead to greater revenue for both the bus lines and the surface lines.

The franchise awarded to the Brooklyn Bus Corporation is for a period of ten years, and is non-renewable. At the expiration of the ten-year period, it will be necessary for the company to obtain a new franchise from the city if it wishes to continue operating along the routes.

Soon after the award of the franchise the Transit Commission held public hearings, at which it gave careful consideration to the objections advanced by two independent bus operators. But as no adequate reasons were offered to show that operation along the routes specified in the franchise would not serve the public, the Transit Commission issued three certificates of convenience and necessity to the Brooklyn Bus Corporation.

One of the certificates of convenience and necessity covers eighteen of the twenty routes. A separate certificate was issued for each of the two routes that were contested by independent operators. This was done to preclude the possibility of a delay in the inauguration of service over the eighteen routes should the independent bus operators secure a stay from the courts.

Five-Cent Fares Specified

The contract with the city provides for a 5-cent fare, with numerous transfer privileges to the surface lines at an additional cost of 2 cents. No transfer privileges exist to the rapid transit lines. The city will receive 5 per cent of the gross earnings with a minimum annual guarantee of $100,000. The contract is so drawn as to terminate automatically if the company, by legislation or recourse to the courts, moves to obtain a higher fare.

Prior to the award of the franchise, the Brooklyn Bus Corporation operated on 10.45 miles of route under special permission from the city. The Brooklyn & Queens Transit Corporation operates buses along 4 miles of route. The two companies together operate a total of 50 buses. These buses will be available for immediate operation on the routes specified in the new franchise. All facilities and equipment of the Brooklyn & Queens Transit Corporation will be made available to the bus company to enable it to begin operation on all the routes as soon as possible. The company is planning to commence operation on July 1 with the 50 buses now available on a number of important routes, and to extend operation to all routes as soon as it can obtain additional equipment and increase its operating force.

According to the plans of operation made by the company, a minimum of 200 buses will be needed for operation along the twenty routes in the franchise. This will necessitate the immediate purchase of 150 new buses. Plans for the increased capitalization of the Brooklyn Bus Corporation necessary to provide for the new equipment, the increased storage and maintenance facilities, and to meet the costs incurred by the legal and engineering services rendered to obtain the franchise, were submitted to the Transit Commission and quickly approved. The capitalization of the Brooklyn Bus Corporation will be increased to 40,000 shares of stock of no par value, of which 20,000 shares will be purchased at $25 per share by the Brooklyn & Queens Transit Corporation and the other 20,000 shares will be held by the bus company, to be sold if and when necessary.

From the $500,000 obtained from the sale of stock, $100,000 will be deposited with the city as a guarantee that the company will comply with all the terms of the contract. The company will forfeit this money should it be guilty of a breach of contract. This amount will also serve as a fund securing the payment to the city of 5 per cent of the gross revenue. Payments will be made to the city after each month of operation.

Of the $400,000 remaining, $100,000 will be used to meet the cost of the legal and engineering services that entered into the preparation of the petition and the securing of the franchise, $200,000 for the purchase of new buses, and $100,000 for increase in the storage and maintenance facilities.

Policies of Companies Are Co-ordinated

As president of the Brooklyn-Manhattan Transit Corporation, the Brooklyn & Queens Transit Corporation and the Brooklyn Bus Corporation, W. S. Menden will control the policies of the three companies. Other officials of the surface lines will also hold supervisory positions in the bus company. It is planned to unify the management and the supervision of operation of the bus company as completely as possible with that of the surface lines, without making the organization unwieldly and inefficient. The maintenance department of the bus company also will be under the supervision of an official of the Brooklyn & Queens Transit Corporation, but it will function as a unit separate from the maintenance departments of the other two companies.

Supervision of transportation for both the bus company and the surface lines will be centered in a new department to be known as the traffic and transportation department. This department will supervise the operation of all buses and street cars of the Brooklyn & Queens Transit Corporation, the buses of the Brooklyn Bus Corporation and the passenger service of the South Brooklyn Railway, another subsidiary of the Brooklyn & Queens. William Siebert, now superintendent of transportation, will be in charge of this department with the title of general superintendent of traffic and transportation. The work of the department will be divided into three divisions: administration, operation and traffic.

Complete Maintenance Schedule Planned for Brooklyn Bus Corporation

MAINTENANCE of buses will be carried out in accordance with the unit replacement and line production systems. It is believed that the periodic overhaul of parts, rather than overhauling the bus as a unit, will give better maintenance and lower cost. After study of the systems of several properties, a system to fit the needs of the Brooklyn Bus Corporation has been outlined. Details have been made flexible so that future changes can be made when operating conditions demand.

Specialization of labor and shop facilities underlie all the plans. Inspection and overhaul periods for all major parts of the bus have been decided on. With accurate and complete records all work will be scheduled as far ahead as possible to reduce peaks in shop work and minimize idle stocks.

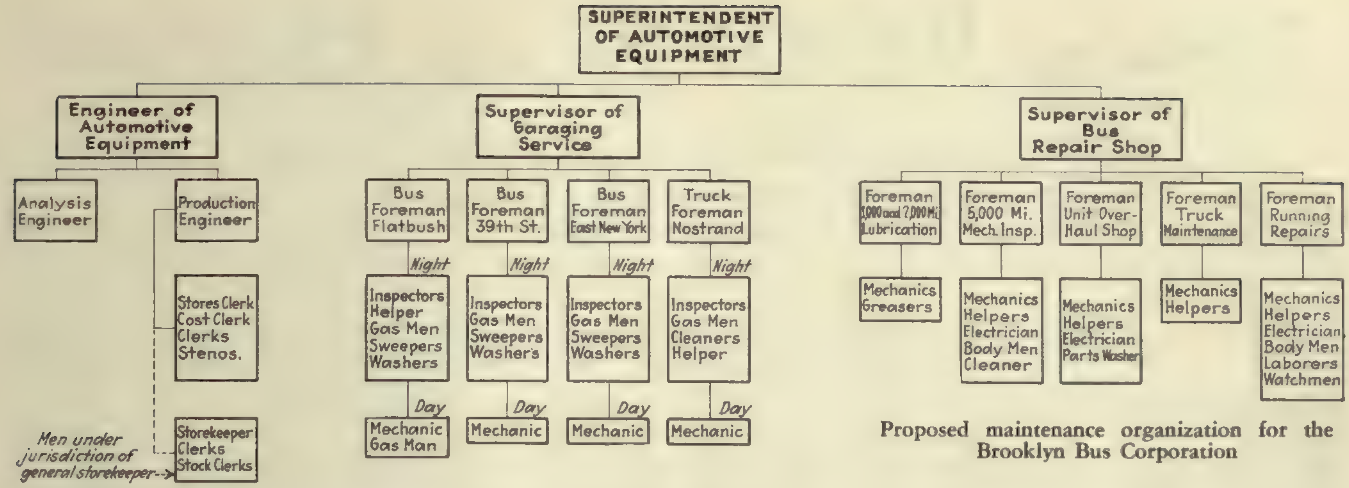
In order to carry out the unit replacement idea effectively all bus maintenance will be segregated into two general classifications: (1) lubrication, and (2) mechanical inspection and overhaul. The classification follows the recommendation of manufacturers, in which it is held that most of the short-interval work, with the exception of some few adjustments, consists of lubrication, while most of the thorough mechanical inspections are of comparatively longer periods. Following these recommendations, separate schedules will be adopted for greasing, oiling, mechanical inspection and overhaul. These schedules will be made flexible so that if there are any improvements in design or maintenance work, the periodicities of the various units may be lengthened.

The storage and repair facilities have been planned for 250 buses and 110 miscellaneous trucks, passenger cars and tractors. Estimates of service and repair work have been based on a daily average of 110 miles for the buses and 60 miles for trucks and miscellaneous vehicles. All scheduled inspection, unit replacement and overhaul work will be done at the 39th Street shop, which was formerly used as a car repair shop. This shop is now being rebuilt and equipped with new tools and machinery for bus maintenance and repair. Heavy body repairs and painting will be done at the car repair shops of the Brooklyn & Queens. The buses will be stored out of doors at three operating centers. These storage points will be equipped with sheds for nightly janitor service and visual inspection.

The proposed inspection schedules have been segregated as shown below. These schedules are only tentative and will be increased as soon as improvements in bus design and inspection methods permit.

1. Nightly service and visual inspection.
2. 1,000-mile greasing schedule.
3. 2,000-mile oil change schedule.
4. 5,000-mile mechanical inspection schedule.

At the end of each daily run buses are to be given a regular service and visual running inspection at the operating centers. All operating and mechanical information concerning a particular bus will be reported on the daily record card, which will be kept in a rack in the bus. During the day each operator using the bus


SUPERINTENDENT OF AUTOMOTIVE EQUIPMENT
Engineer of Automotive Equipment
Supervisor of Garaging Service
Supervisor of Bus Repair Shop
Analysis Engineer
Production Engineer
Stores Clerk
Cost Clerk
Clerks
Stenos.
Men under jurisdiction of general storekeeper
Storekeeper
Clerks
Stock Clerks
Bus Foreman Flatbush
Bus Foreman 39th St.
Bus Foreman East New York
Truck Foreman Nostrand
Night
Inspectors Helper Gas Men Sweepers Washers
Inspectors Gas Men Sweepers Washers
Inspectors Gas Men Sweepers Washers
Inspectors Gas Men Cleaners Helper
Day
Mechanic Gas Man
Mechanic
Mechanic
Mechanic
Foreman 1,000 and 7,000 Mi. Lubrication
Foreman 5,000 Mi. Mech. Insp.
Foreman Unit Over-Haul Shop
Foreman Truck Maintenance
Foreman Running Repairs
Mechanics Greasers
Mechanics Helpers Electrician Body Men Cleaner
Mechanics Helpers Electrician Parts Washer
Mechanics Helpers
Mechanics Helpers Electrician Body Men Laborers Watchmen

Proposed maintenance organization for the Brooklyn Bus Corporation

will record all defects as they develop during his run.

In addition, tires of all buses will be visually checked for inflation every night and actually gaged and inflated every other night. Windows and the outside of the bus will be washed twice per week. Floors will be swept every night. A general inspection of each bus will be made by an inspector every night. He will be held responsible for the condition of all buses at the morning pull-out which he has passed on as being O.K. A few mechanics on the night force will only handle minor defects. All major defects or adjustments must be held over for the running repair crew at the repair shop on the following day.

The lubrication schedule at 1,000 miles includes the greasing of all fittings and grease cups and the oiling of joints as required. The schedule for oil changing includes the entire 1,000 mile schedule and additional items of work, such as engine oil change and the replenishing of the transmission and differential oil when necessary.

A period of 5,000 miles for mechanical inspection has been arbitrarily chosen and may be changed as experience will be obtained with the system. All work to be done on this inspection is listed on an inspection guide and record, with a set of detailed instructions for the maintenance men. Inspectors performing this work are charged with the responsibility of the performance of all parts of this bus until the next inspection.

An inspection guide and record will be posted adjacent to each bus every time it is inspected, and the man responsible must initial each item or each group of items of work he has performed. These records will be filed and any unit failure or defect between inspection periods will be charged against the individual who performed the inspection. The instructions for the 5,000-mile inspection period are intended to cover systematic inspection of bus equipment for the fixed period.

The segregation of the overhaul schedule to be carried out at the repair shop is shown in the accompanying table.

Overhaul	*Semi-Overhaul*	*Complete Overhaul*
Engine	50,000 and 100,000 miles	150,000 miles
Transmission (gearset and clutch)	75,000 miles	150,000 miles
Steering gear		100,000 miles
Front axle		100,000 miles
Differential (rear axle)	50,000 and 100,000 miles	150,000 miles
Air compressor		60,000 miles
Generator		50,000 miles
New springs		50,000 to 75,000 miles

The repair shop is centrally located and has been designed to handle all bus work from ordinary greasing to complete unit overhaul necessary to maintain a fleet of 250 buses and 125 trucks. With slight extensions the layout can easily handle a fleet of 500 buses. All automotive work, except nightly janitor service and heavy body work will be done at this shop. An attempt will be made completely to specialize the use of all shop space. Two lines, over a depressed floor, will be reserved for all lubrication work, and three other lines over which crane service is to be provided have been reserved for the 5,000-mile inspections, unit change and unscheduled running repairs. These five production lines run the length of the shop, each line having working positions which are reserved for specific parts of the maintenance work.

The entire shop has been confined to a section 300 ft. long by the full width of the building. The unit overhaul shop, salvage area, storeroom, battery room, tire room and offices have been placed at strategic locations with respect to the working positions in the shop area, so that a natural flow of material and work can be developed throughout the entire shop.

When a thorough mechanical inspection is being performed or when a unit is being replaced, the bus will be supported in such a way that all units are readily accessible or removable. The bus will be placed on dollies so that it can readily be moved along the production lines. These dollies operate on the existing standard gage track. The buses will be mounted on them at the beginning of any position along the line by means of two 5-ton overhead cranes.

The organization of the repair shop is broken into three groups; namely, engineering, garage servicing and repair. All these groups are controlled by the superintendent of bus maintenance, whose function is to guide and co-ordinate their activities.

The engineer of automotive equipment will be the officer for liaison between the two operating groups and will digest all records which are kept under his jurisdiction so that improvements in methods, cost and operating results can always be planned and developed. Under his control will be the analysis engineer, who is not connected with any of the daily operations of the department but is free to work on innumerable problems awaiting analysis such as outdoor bus heating, improvements in fuel consumption and other similar problems.

The supervisor of the garage services has charge of the foreman of the various truck and bus operating garages. The supervisor of the repair shop has charge of the foreman of all scheduled inspections and major repair and overhaul work on both buses and trucks.

Trend of REVENUES *and* EXPENSES

Latest monthly figures indicate little change in situation
from last report. Most of the companies
show net surplus

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
Boston Elevated Railway, Boston, Mass.						
May, 1930	2,824,945	*5.17*	2,084,708	*2.50*	302,590	*25.51*
June	2,550,775	*3.93*	1,937,134	*3.05*	143,016	*36.53*
July	2,371,152	*5.04*	2,108,071	0.61	*167,523*	*489.94*
Aug.	2,280,322	*7.81*	2,113,183	*1.55*	*274,728*	*163.79*
Sept.	2,470,918	*3.78*	2,091,718	0.52	*59,868*	*200.31*
Oct.	2,811,399	*4.04*	2,157,474	*1.29*	221,188	*31.30*
Nov.	2,579,899	*10.34*	2,066,206	*2.56*	71,150	*77.85*
Dec.	2,850,330	*8.20*	2,178,896	2.24	235,950	*56.62*
Jan., 1931	2,840,159	*8.43*	2,082,456	*6.23*	314,067	*30.56*
Feb.	2,534,828	*8.33*	1,952,032	*5.23*	142,339	*48.27*
Mar.	2,769,564	*7.30*	2,019,081	*4.92*	309,212	*29.08*
Apr.	2,616,188	*7.00*	1,909,176	*7.93*	275,740	*11.45*
May	2,579,265	*8.70*	1,993,753	*4.36*	143,804	*52.47*
Brooklyn-Manhattan Transit System, New York, N. Y.						
May, 1930	5,229,829	21.65	3,600,727	22.46	929,201	35.36
June	5,070,028	21.64	3,591,743	21.59	776,745	28.77
July	5,003,577	*2.86*	3,608,741	*6.06*	720,302	18.55
Aug.	4,727,623	*4.39*	3,558,841	*6.64*	465,144	*14.91*
Sept.	4,834,251	*2.49*	3,453,431	*4.52*	667,323	6.20
Oct.	5,036,775	*2.58*	3,572,553	*4.22*	758,817	2.78
Nov.	4,769,083	*4.37*	3,366,923	*6.98*	689,470	2.34
Dec.	5,065,484	*2.56*	3,546,963	*4.25*	814,788	2.04
Jan., 1931	4,852,706	*5.48*	3,475,330	*7.01*	674,029	*5.80*
Feb.	4,453,655	*3.79*	3,159,903	*5.96*	583,468	2.40
Mar.	5,028,562	*2.56*	3,475,847	*3.37*	814,360	*4.13*
Apr.	4,969,481	*2.09*	3,458,940	*3.35*	804,235	0.25
May	5,056,779	*3.31*	3,438,037	*4.51*	913,877	*1.64*
Brooklyn & Queens Transit System, New York, N. Y.						
May, 1930	2,030,966	*4.65*	1,615,294	*7.31*	310,865	9.11
June	1,968,238	*2.41*	1,603,996	*8.02*	257,482	18.78
July	1,917,118	*6.15*	1,603,893	*7.10*	203,433	*4.15*
Aug.	1,827,238	*6.45*	1,595,256	*7.11*	120,864	*8.15*
Sept.	1,887,499	*4.66*	1,564,271	*5.65*	213,728	*2.66*
Oct.	1,922,388	*5.20*	1,597,166	*5.50*	214,924	*7.74*
Nov.	1,820,498	*5.65*	1,522,735	*7.58*	187,822	5.20
Dec.	1,920,463	*4.40*	1,560,950	*6.11*	250,893	6.06
Jan., 1931	1,849,644	*6.18*	1,541,235	*7.58*	197,355	3.02
Feb.	1,704,677	*3.98*	1,416,192	*5.40*	176,217	2.58
Mar.	1,941,078	*1.98*	1,602,862	*2.56*	227,472	1.21
Apr.	1,911,878	*1.29*	1,592,919	*3.11*	208,514	6.86
May	1,980,118	*2.50*	1,585,293	*1.85*	286,334	*7.89*
Capital Traction Company, Washington, D. C.						
May, 1930	369,413	*5.11*	285,970	*3.10*	53,985	*16.72*
June	340,623	*5.25*	271,761	*3.80*	40,884	*16.70*
July	306,527	*9.02*	272,490	*4.65*	4,935	*78.13*
Aug.	314,513	*3.48*	268,561	*4.09*	16,103	2.62
Sept.	327,713	*7.06*	268,066	*1.61*	30,259	6.78
Oct.	374,646	1.22	288,351	*1.48*	58,638	17.56
Nov.	346,054	*2.70*	273,481	*1.54*	42,659	*11.05*
Dec.	369,885	*1.77*	274,221	*3.21*	67,651	0.61
Jan., 1931	347,491	*3.06*	280,514	*3.30*	37,705	5.11
Feb.	312,815	*3.47*	252,080	*5.68*	30,521	*1.87*
Mar.	344,191	*2.65*	270,962	*3.86*	43,847	*4.03*
Apr.	366,276	*2.39*	273,436	*5.89*	65,123	12.93
May	362,502	*1.87*	281,344	*1.61*	50,959	*5.60*
Chicago Surface Lines, Chicago, Ill.						
May, 1930	5,012,190	*6.39*	3,986,513	*4.11*	831,499	*7.91*
June	4,766,687	*6.89*	3,835,838	*4.49*	776,880	*7.48*
July	4,535,460	*10.05*	3,807,075	*7.10*	649,307	*19.05*
Aug.	4,488,146	*12.20*	3,796,705	*8.06*	680,219	*15.82*
Sept.	4,568,564	*9.50*	3,789,472	*4.40*	713,323	*12.94*
Oct.	4,879,570	*10.79*	3,933,416	*7.35*	799,118	*11.69*
Nov.	4,537,647	*13.48*	3,769,538	*6.86*	712,177	*20.77*
Dec.	4,846,000	*8.09*	3,984,572	*9.89*	767,348	*15.67*
Jan., 1931	4,576,133	*12.65*	3,825,964	*5.37*	718,129	*21.00*
Feb.	4,234,704	*10.90*	3,665,038	*6.04*	601,726	*15.44*
Mar.	4,584,224	*4.35*	4,287,237	*5.34*	557,167	15.05
Apr.	4,759,624	*4.46*	4,092,047	0.36	675,629	*11.66*
May	4,541,847	*9.38*	3,802,582	*4.61*	724,514	*12.88*
Department of Street Railways, Detroit, Mich.						
May, 1930	1,974,359	*16.21*	1,608,353	*17.80*	243,875	*10.54*
June	1,787,953	*18.50*	1,511,572	*14.43*	159,027	*46.43*
July	1,549,503	*27.41*	1,452,871	*14.20*	*41,888*	*113.55*
Aug.	1,516,209	*29.02*	1,426,941	*16.67*	*52,773*	*119.46*
Sept.	1,510,161	*26.36*	1,436,175	*12.59*	*51,711*	*115.40*
Oct.	1,579,476	*25.84*	1,458,238	*14.91*	22,933	*91.71*
Nov.	1,481,136	*23.35*	1,333,571	*13.38*	4,890	*98.14*
Dec.	1,610,179	*22.59*	1,440,503	*21.67*	23,052	*77.93*
Jan., 1931	1,550,656	*28.54*	1,421,575	*20.95*	12,759	*91.44*
Feb.	1,431,468	*25.58*	1,323,683	*18.96*	*28,309*	*117.91*
Mar.	1,696,308	*16.58*	1,415,021	*18.68*	133,347	*11.03*
Apr.	1,605,536	*19.51*	1,368,187	*20.82*	101,041	*27.10*
May	1,531,767	*22.42*	1,306,654	*18.75*	75,494	*69.04*

*Decreases or deficits are shown by *italic figures*.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
Eastern Massachusetts Street Railway, Boston, Mass.						
May, 1930	663,941	*7.87*	451,941	*8.04*	53,076	*34.20*
June	619,456	*9.64*	435,292	*6.43*	28,672	*58.48*
July	617,220	*10.11*	461,048	*7.27*	3,926	*91.22*
Aug.	624,332	*9.42*	444,429	*10.33*	28,399	*52.01*
Sept.	o12,237	*7.12*	448,470	*0.88*	21,771	*70.76*
Oct.	623,872	*8.48*	467,773	*4.92*	15,811	*76.73*
Nov.	590,856	*10.90*	449,032	*1.60*	205	*97.62*
Dec.	670,964	*11.93*	516,913	1.71	20,841	*84.02*
Jan., 1931	700,961	*7.63*	472,079	*2.88*	36,145	*56.16*
Feb.	639,344	*6.62*	434,904	*2.83*	33,058	*50.86*
Mar.	685,614	*3.63*	472,317	*1.53*	28,982	*81.83*
Apr.	617,705	*5.21*	434,716	*2.59*	9,906	*78.95*
May	....	.....	....	.....	.....	......
Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y.						
May, 1930	79,126	*6.80*	65,512	0.00	*13,182*	*32.16*
June	72,865	*15.19*	65,324	*25.80*	*12,940*	*172.80*
July	60,907	*21.02*	64,134	*11.58*	*24,217*	*110.22*
Aug.	64,592	*18.82*	62,484	*8.19*	*12,690*	*36.45*
Sept.	72,267	*11.61*	63,549	*5.42*	*8,497*	*436.09*
Oct.	75,708	*17.80*	66,353	*0.59*	*18,447*	*226.80*
Nov.	72,024	*13.82*	66,314	*0.23*	*21,171*	*158.25*
Dec.	....	.....	....	.....	....	......
Jan., 1931	79,764	*15.78*	67,438	*7.38*	*13,133*	*236.77*
Feb.	74,018	*13.38*	62,239	*7.93*	*13,594*	*75.36*
Mar.	75,201	*7.83*	64,051	*7.61*	*13,965*	*5.28*
Apr.	70,660	*0.48*	62,685	*4.90*	*16.298*	23.64
May	....	.....	....	.....	.....	......
Galveston-Houston Electric Railway, Houston, Tex.					†	†
May, 1930	41,686	*15.21*	27,945	*12.21*	*65,653*	*101.96*
June	45,659	*20.34*	28,273	*10.93*	*74,054*	*114.30*
July	46,757	*9.65*	29,248	*3.52*	*78,159*	*123.50*
Aug.	47,425	*11.42*	28,402	*8.12*	*82,135*	*146.25*
Sept.	42,823	*16.49*	28,052	*14.83*	*84,893*	*144.43*
Oct.	38,032	*11.56*	27,266	*6.85*	......	......
Nov.	36,974	*12.49*	44,183	*9.58*	*93,685*	*127.12*
Dec.	36,166	*15.00*	27,949	*1.79*	*99,343*	*112.93*
Jan., 1931	33,291	*20.15*	25,057	*9.18*	*105,000*	*110.59*
Feb.	32,281	*19.80*	22,990	*9.64*	*111,369*	*110.17*
Mar.	32,904	*22.38*	24,732	*14.59*	*114,459*	*93.49*
Apr.	34,729	*15.98*	24,132	*11.98*	*117,394*	*189.69*
May	....	.....	....	.....	....	......
Houston Electric Company, Houston, Tex.					†	†
May, 1930	262,653.	*8.60*	194,968	*1.94*	597,837	*4.56*
June	247,461	*11.67*	179,084	*10.27*	589,240	*6.38*
July	247,070	*10.86*	176,909	*11.82*	584,163	*1.24*
Aug.	244,033	*12.41*	177,452	*10.89*	573,872	*4.18*
Sept.	251,919	*9.00*	175,905	*10.42*	571,857	*5.84*
Oct.	267,306	*7.57*	181,499	*10.67*	573,425	*4.16*
Nov.	247,210	*10.00*	176,739	*1.96*	550,635	*9.55*
Dec.	258,219	*9.84*	180,678	*0.68*	524,458	*16.64*
Jan., 1931	242,554	*10.52*	176,792	*11.08*	518,843	*17.70*
Feb.	223,256	*14.11*	163,249	*12.96*	507,328	*20.19*
Mar.	244,396	*10.97*	170,067	*12.70*	502,405	*19.39*
Apr	....	.....	....	.....	.....	......
May	....	.....	....	.....	......	......
Hudson & Manhattan Railroad, New York, N. Y.						
May, 1930	1,039,637	*2.79*	509,707	*3.06*	194,759	*2.49*
June	989,627	*1.69*	499,396	*1.74*	154,985	*4.49*
July	954,538	*3.12*	502,515	*1.61*	116,747	*15.77*
Aug.	934,204	*5.65*	499,806	*3.98*	98,977	*26.27*
Sept.	974,433	*2.80*	506,845	0.23	132,332	*18.68*
Oct.	1,033,584	*4.33*	521,325	*1.97*	176,999	*17.79*
Nov.	994,735	*6.18*	489,761	*4.08*	169,465	*21.42*
Dec.	1,060,614	*4.66*	419,109	*17.40*	306,321	12.49
Jan., 1931	1,005,022	*7.62*	512,350	*7.23*	157,098	*21.78*
Feb.	936,542	*5.67*	467,137	*6.09*	134,717	*16.34*
Mar.	1,013,577	*6.05*	497,695	*6.34*	180,554	*15.13*
Apr.	1,002,265	*5.78*	485,938	*5.73*	181,182	*15.09*
May	974,737	*6.24*	481,504	*5.53*	158,191	*18.77*
Illinois Terminal Company, Springfield, Ill.						
May, 1930	608,403	*4.65*	427,471	*2.78*	142,226	*10.42*
June	566,548	*8.98*	444,638	0.00	86,421	*35.96*
July	601,515	*11.03*	475,856	*3.24*	87,602	*35.74*
Aug.	661,520	*7.65*	466,816	*12.07*	152,827	12.15
Sept.	654,477	*5.26*	454,818	*9.66*	160,897	14.62
Oct.	691,672	*2.54*	506,107	*2.41*	148,701	11.61
Nov.	542,672	*11.02*	430,907	*6.24*	80,529	*23.11*
Dec.	577,425	*13.69*	421,987	*14.26*	127,588	5.66
Jan., 1931	509,641	*20.77*	395,953	*19.80*	87,742	*9.83*
Feb.	498,067	*5.89*	388,126	*3.81*	84,381	2.26
Mar.	568,653	*1.95*	398,855	*5.94*	143,325	28.98
Apr.	547,992	*7.17*	395,315	*6.46*	127,179	*3.24*
May	....	.....	....	.....	.....	......

†Net income is shown for the preceding twelve months.

Trend of Revenues and Expenses by Months *(Concluded)*

Interborough Rapid Transit Company, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	6,287,149	0.41	4,095,439	9.22	*144,798*	*122.44*
June..........	5,832,071	1.85	4,027,730	10.58	*218,727*	*348.57*
July..........	5,382,547	*1.53*	4,078,983	2.52	*521,582*	*73.64*
Aug...........	5,183,166	*4.59*	4,121,083	5.06	*763,482*	*172.17*
Sept..........	5,684,267	0.17	3,983,368	7.78	*131,270*	*206.26*
Oct...........	6,315,679	*1.13*	4,162.660	*0.83*	161,417	207.14
Nov...........	5,965,365	*4.96*	3,869,340	0.00	*272,021*	*121.79*
Dec...........	6,477,864	*0.52*	4,194,315	3.96	*293,152*	*47.40*
Jan., 1931.....	6,123,645	*4.42*	4,538,833	10.83	*348,972*	*65.92*
Feb...........	5,570,354	*3.27*	3,653,798	*2.10*	*321,587*	*10.36*
Mar...........	6,293,013	*2.24*	3,973,704	*4.61*	*212,644*	6.65
Apr...........	6,127,713	*2.38*	3,993,181	*2.83*	*189,134*	*17.33*
May...........	6,006,273	*4.47*	3,932,452	*3.98*	*207,096*	*36.12*

Jacksonville Traction Company, Jacksonville, Fla.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $* †	Increase or Decrease Per Cent* †
May, 1930....	89,731	*9.29*	80,106	*7.92*	*66,663*	*39.81*
June..........	79,087	*12.73*	77,848	7.08	*71,399*	*41.50*
July..........	78,772	*11.02*	77,787	*11.27*	*70,688*	*35.34*
Aug...........	77,441	*12.10*	78,177	*13.82*	*68,188*	*19.92*
Sept..........	78,529	*9.54*	75,012	*11.15*	*66,335*	*8.16*
Oct...........	84,424	*12.50*	76,374	*13.72*	*65,525*	*2.18*
Nov...........	81,250	*12.24*	69,437	*16.02*	*62,599*	0.15
Dec...........	89,903	*11.47*	74,836	*11.49*	*63,204*	*4.62*
Jan., 1931.....	87,160	*8.08*	77,998	*13.67*	*58,133*	11.98
Feb...........	76,205	*15.60*	75,462	*28.14*	*77,874*	*23.42*
Mar...........	84,018	*12.36*	77,758	*4.09*	*87,048*	*31.90*
Apr...........	81,695	*11.48*	74,847	6.57	*92,573*	*142.13*
May...........	......	.....	......	....	......	......

Kansas City Public Service Company, Kansas City, Mo.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $* †	Increase or Decrease Per Cent* †
May, 1930....	719,705	*5.03*	594,064	*1.49*	45,132	*41.06*
June..........	656,292	*8.03*	562,308	*4.19*	6,396	*84.76*
July..........	635,205	*11.09*	573,990	*2.92*	*21,365*	*144.42*
Aug...........	622,554	*13.17*	530,094	*11.41*	15,479	*64.11*
Sept..........	650,114	*9.99*	524,324	*12.12*	50,261	*1.32*
Oct...........	725,428	*4.89*	700,311	12.90	*60,435*	*190.35*
Nov...........	706.577	*5.29*	572,066	*7.04*	58,994	5.69
Dec...........	758,045	*1.73*	570,065	*14.58*	108,444	*284.88*
Jan., 1931.....	....	.....	....	.....	......	.....
Feb...........	....	.....	....	.....	......	.....
Mar...........	....	.....	....	.....	......	.....
Apr...........	710,719	*0.69*	565,328	*6.09*	71,298	82.34
May...........	702,760	*2.35*	562,482	*5.31*	64,474	42.86

Long Island Railroad, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	3,346,650	*6.25*	2,542,463	*3.10*	632,246	*18.11*
June..........	3,662,765	*4.22*	2,512,947	*3.06*	994,868	*4.62*
July..........	4,018,939	*5.76*	2,668,042	*3.56*	1,180,528	*11.19*
Aug...........	3,968,936	*5.21*	2,635,376	*5.06*	1,152,651	*6.59*
Sept..........	3,589,671	*7.33*	2,467,056	*7.07*	928,655	*6.58*
Oct...........	3,371,761	*5.80*	2,446,346	*8.97*	729,067	1.77
Nov...........	2,954,624	*4.20*	2,249,258	*14.56*	483,180	89.15
Dec...........	2,905,045	*6.60*	2,130,182	*16.27*	596,812	47.11
Jan., 1931.....	2,763,421	*5.65*	2,210,263	*9.65*	321,141	*6.00*
Feb...........	2,561,169	*7.43*	2,074,216	*9.13*	332,002	*3.86*
Mar...........	2,841,915	*3.09*	2,234,418	*9.00*	449,501	24.64
Apr...........	2,976,402	*4.69*	2,269,029	*7.37*	533,425	1.97
May...........	....	.....	....	.....	.....	......

Market Street Railway, San Francisco, Cal.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	792,536	*3.28*	675,407	*1.18*	61,527	*20.20*
June..........	743,277	*4.64*	646,615	*1.84*	42,297	*31.01*
July..........	735,453	*5.87*	649,901	*1.68*	32,534	*46.39*
Aug...........	770,284	*6.69*	643,287	*5.46*	72,923	*16.56*
Sept..........	745,298	*5.35*	626,770	*3.74*	64,731	*16.38*
Oct...........	786,012	*6.73*	675,908	*6.49*	57,384	*45.58*
Nov...........	729,407	*8.81*	615,613	*6.18*	60,457	*29.25*
Dec...........	775,508	*5.12*	639,249	*5.52*	83,460	*0.03*
Jan., 1931.....	738,092	*5.55*	641,519	*4.83*	45,011	*12.31*
Feb...........	668,931	*8.17*	576,661	*8.22*	41,002	7.29
Mar...........	757,960	*6.40*	633,346	*6.81*	72,828	*0.05*
Apr...........	745,252	*6.72*	620,106	*7.06*	73,837	*3.46*
May...........	733,105	*7.50*	619,934	*8.21*	62,805	2.08

New York, Westchester & Boston Railway, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	230,781	3.44	149,901	3.66	*148,173*	7.86
June..........	227,026	1.80	147,692	*4.06*	*147,821*	2.82
July..........	224,469	*5.89*	146,233	*6.00*	*152,633*	5.38
Aug...........	196,405	*10.53*	152,180	*0.41*	*184,982*	*22.45*
Sept..........	203,617	*8.18*	165,256	6.57	*192,861*	*29.53*
Oct...........	202,046	*7.52*	138,192	*14.09*	*190,748*	*20.81*
Nov...........	184,690	*8.74*	170,542	2.52	*216,451*	19.75
Dec...........	190,136	*12.31*	138,592	*17.80*	*205,029*	16.75
Jan., 1931.....	182,249	*13.76*	160,800	9.44	*220,394*	*32.37*
Feb...........	161,311	*15.02*	149,571	*11.18*	*222,308*	*29.42*
Mar...........	181,729	*12.80*	144,442	3.54	*195,802*	*24.31*
Apr...........	186,708	*13.03*	142,832	0.31	*189,142*	*19.00*
May...........	....	.....	....	.....	.....	......

Northwestern Pacific Railroad, Sausalito, Cal.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	485,027	*9.33*	482,698	5.49	2,800	*103.81*
June..........	504,138	*4.31*	448,510	*3.76*	42,824	*29.33*
July..........	597,419	*2.54*	392,575	*18.52*	195,195	55.38
Aug...........	638,476.	*11.48*	415,502	*18.64*	210,115	4.03
Sept..........	548,282	*8.68*	471,657	*3.78*	16,471	*83.57*
Oct...........	555,867	*18.49*	534,858	4.44	7,447	*95.22*
Nov...........	333,193	*27.74*	421,717	*16.33*	97,567	*120.85*
Dec...........	312,319	*20.77*	465,220	*3.46*	158,491	*74.63*
Jan., 1931.....	283,852	*21.78*	401,656	*14.41*	123,928	*14.76*
Feb...........	273,818	*27.40*	387,512	*12.96*	*122,531*	68.87
Mar...........	308,466	*24.17*	408,068	*14.43*	*109,855*	*48.81*
Apr...........	322,742	*25.66*	402,400	*16.55*	*88,300*	*58.51*
May...........	....	.....	....	.....	.....	......

*Decreases or deficits are shown by *italic figures.*

†Net income is shown for the preceding twelve months.

Staten Island Rapid Transit Company, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	214,848	*20.61*	176,605	*9.84*	25,183	0.00
June..........	224,980	*18.31*	178,999	*10.17*	30,052	*30.63*
July..........	243,991	9.78	189,173	39.19	41,021	*34.99*
Aug...........	233,371	*13.92*	168,110	*11.19*	49,486	*33.97*
Sept..........	206,908	*15.93*	165,525	*4.87*	26,127	*60.73*
Oct...........	205,631	*10.58*	167,586	*6.49*	29,723	*26.11*
Nov...........	178,652	*17.42*	161,608	*0.58*	10,788	*80.37*
Dec...........	178,474	*9.08*	160,715	47.29	5,997	*92.23*
Jan., 1931.....	170,387	*9.58*	158,982	*6.36*	*1,448*	*114.6*
Feb...........	161,415	*13.58*	142,565	*9.20*	2,151	*93.49*
Mar...........	173,723	*7.98*	159,035	*7.78*	*1,164*	*81.24*
Apr...........	176,863	*10.76*	147,210	*13.23*	23,169	*31.91*
May...........	....	.....	....	.....	....	.....

Third Avenue Railway System, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930‡...	1,291,409	*6.92*	1,043,554	*7.63*	58,138	84.27
June‡.........	1,244,961	*6.73*	1,018,619	*7.64*	45,078	1,056.24
July..........	1,429,730	*5.18*	1,212,311	*8.54*	2,066	106.36
Aug...........	1,350,064	*5.88*	1,180,853	*8.08*	*46,540*	28.34
Sept..........	1,428,136	*3.48*	1,167,528	*8.36*	45,636	277.91
Oct...........	1,456,688	*4.03*	1,205,455	9.73	36,257	317.06
Nov...........	1,373,335	*5.37*	1,146,168	*10.17*	12,079	130.15
Dec...........	1,438,752	*3.49*	1,197,249	*8.51*	26,250	186.44
Jan., 1931.....	1,393,054	*5.10*	1,178,797	*9.14*	*1,594*	96.33
Feb...........	1,274,832	*4.27*	1,070,307	*8.56*	*11,143*	*126.49*
Mar...........	1,418,429	*3.38*	1,174,984	*6.86*	27,364	430.88
Apr...........	1,408,235	*3.25*	1,155,880	*5.98*	44,331	250,25
May...........	....	.....	....	.....	....	......

‡Excluding buses.

United Electric Railways, Providence, R. I.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930...	569,925	*7.18*	514,320	*1.38*	5,602	*88.30*
June..........	532,783	*13.87*	478,197	*5.39*	4,583	*85.66*
July..........	513,367	*11.04*	458,817	*8.90*	5,480	*77.94*
Aug...........	495,723	.....	442,076	.....	3,643	.....
Sept..........	493,296	*12.72*	434,036	*10.39*	8,376	*72.04*
Oct...........	531,803	*13.76*	....	.....	41,223	*53.80*
Nov...........	506,318	*14.58*	439,930	*12.83*	16,958	*54.37*
Dec...........	559,363	*13.02*	460,420	*21.92*	51,623	889.51
Jan., 1931....	543,940	*13.39*	493,596	*12.94*	372	*95.68*
Feb...........	482,566	*14.30*	437,444	*13.02*	*4,503*	*150.71*
Mar...........	524,299	*10.44*	480,958	*9.38*	*6,233*	*265.73*
Apr...........	510,645	*9.39*	470,964	*7.60*	*9,992*	*455.60*
May...........	509,278	*10.64*	474,803	*7.52*	*15,021*	*168.13*

United Railways & Electric Company, Baltimore, Md.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
May, 1930....	1,457,181	*0.42*	1,125,365	*0.52*	73,214	13.05
June..........	1,332,275	*2.63*	1,043,008	*2.92*	35,318	4.76
July..........	1,236,414	*6.91*	964,582	*6.24*	14,358	*59.85*
Aug...........	1,198,180	*8.34*	831,241	*18.41*	6,119	*71.42*
Sept..........	1,261,734	*6.71*	995,805	*5.02*	10,050	*75.81*
Oct...........	1,354,086	*7.28*	1,049,306	*4.84*	25,163	*71.16*
Nov...........	1,263,811	*10.26*	983,047	*7.40*	9,200	*87.30*
Dec...........	1,350,553	*8.19*	1,043,315	*7.25*	36,700	*54.54*
Jan., 1931.....	1,268,536	*10.90*	994,411	*11.89*	7,388	*69.22*
Feb...........	1,136,604	*15.78*	891,421	*15.97*	*24,088*	*231.15*
Mar...........	1,262,429	*14.90*	981,026	*14.76*	12,212	*84.94*
Apr..........	1,253,764	*13.50*	966,424	*13.56*	11,440	*82.93*
May..........	1,256,334	*13.78*	991,107	*11.93*	2,206	*96.99*

Monthly and Other Financial Reports

Boston Elevated Railway, Boston, Mass.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
3 mo. end. Mar., 1931	8,144,551	5,641,148	417,432	2,102,968	*3,782c*
3 mo. end. Mar., 1930	8,853,590	5,999,903	414,014	247,913	392,203c

Cincinnati Street Railway, Cincinnati, Ohio

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
May, 1931..........	653,309	424,875	59,488	205,040	11,200

Honolulu Rapid Transit Co., Honolulu, Hawaii

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
April, 1931..........	83,280	51,294	7,744	14,749c	14,749
April, 1930..........	85,065	46,272	8,819	20,363c	18,295
4 mo. end. Apr., 1931.	330,835	201,983	33,485	57,627c	57,627
4 mo. end. Apr., 1930.	344,390	206,351	35,277	63,246c	58,689

Mexico Tramways, Mexico City, Mex. (In Pesos)

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
April, 1931..........	774,360	843,110	......	*68,750*	.....
April, 1930..........	833,150	896,510	......	*63,360*	......
4 mo. end. Apr., 1931.	3,043,590	3,437,710	......	*394,120*	.....
4 mo. end. Apr., 1930.	3,324,610	3,533,340	......	*208,730*	......

New York Railways, New York, N. Y.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
April, 1931..........	452,547	394,032a	......	58,515	10,346
April, 1930..........	453,266	414,223a	......	39,043	*22,740*
4 mo. end. Apr., 1931.	1,327,755	1,556,065a	......	176,690	22,195
4 mo. end. Apr., 1930.	1,783,395	1,658,785a	......	124,610	*124,183*

North Coast Transportation Co., Seattle, Wash.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
January, 1931........	172,704	152,133	9,868	10,701	......
8 mo. end. Jan., 1931...	1,601,423	1,232,787	72,632	296,001	187,166

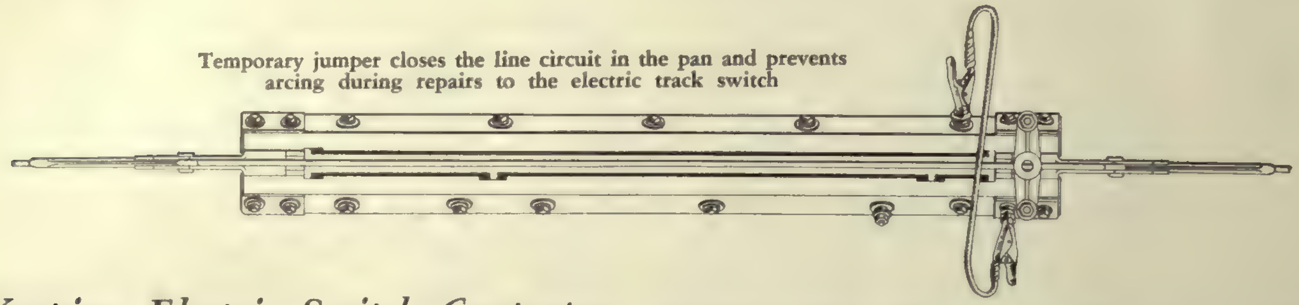
York Railways, York, Pa.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
3 mo. end. Mar., 1931	753,927	399,251a	......	354,676	265,492b
3 mo. end. Mar., 1930	805,906	418,949a	......	386,957	300,980b
9 mo. end. Mar., 1931	2,889,374	1,624,945a	......	1,264,429	942,434b
9 mo. end. Mar., 1930	2,883,040	1,621,403a	......	1,261,637	950,162b

Italic figures indicate deficits. a Includes taxes. b Before depreciation.
c After dividends.

Practical MAINTENANCE *Ideas*

Temporary jumper closes the line circuit in the pan and prevents arcing during repairs to the electric track switch



*Keeping Electric Switch Contactors Alive During Repairs**

By H. A. Brown
Return Circuit Switch and Signal Division
Cleveland Railway

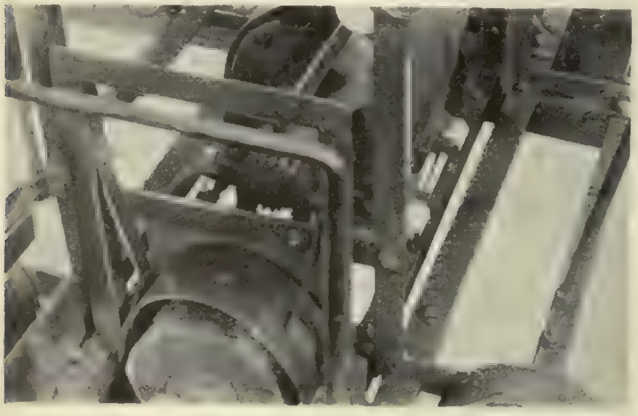
TEMPORARY jumpers are attached to overhead electric switch contactors to keep them energized when renewals or repairs to the electric track switch are being made. This eliminates the necessity of holding up cars or permitting them to pass under the dead pan. In passing under a dead pan the trolley wire or the contactor may be burned by the arc caused by breaking the load current. The jumper is a piece of No. 8 wire, about 3 ft. long, with a battery clip at each end. It is attached to the running iron contacts ahead of the relay wire connections, as shown in the illustration.

*Motor Mounting for Track Grinders**

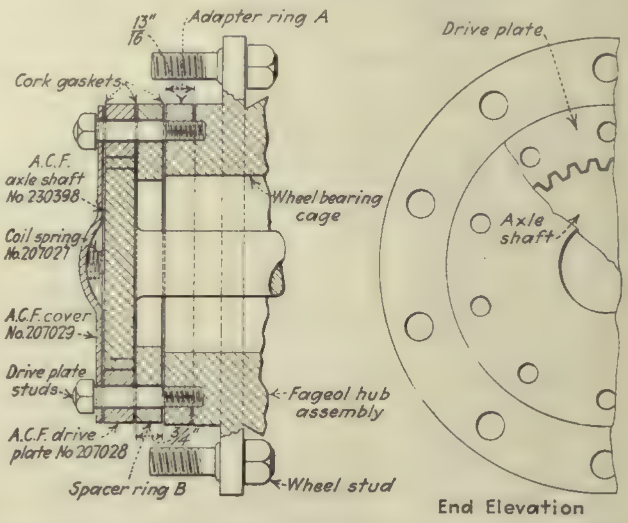
By B. C. Dawson
Mechanic
Toronto Transportation Commission

MOTORS of track grinders must be kept in alignment with the grinding wheel if undue wear on the gears and chain belt is to be avoided. When grinding high or low spots, the motor is raised or lowered to maintain the proper tension in the chain belt, and, in doing this, adjustments are made to keep the motor in alignment with the grinding wheel. To facilitate this task and to assure proper alignment at all times, the motor has been hinged on one side to the frame and adjusting screws placed on the other side. By this means the motor position can be adjusted to the proper alignment and height in little time. The chain slack can be taken up to the correct tension by moving the motor on the hinges as the center.

Formerly, these grinding machines were adjusted by placing shims between the motor suspension lugs and the frame. In making these adjustments in the field it was found that much time was needed, and very often the motor was soon after thrown out of alignment.



Attachment by hinges facilitates grinding motor alignment



How the rear hubs of buses on the San Diego Electric Railway have been remodeled to accommodate full-floating axle shafts

*Rear Hubs Remodeled for Full-Floating Axle Shafts**

By Charles Herms
General Foreman
San Diego Electric Railway

SHAFTS for axles of the semi-floating type are rigidly connected to the hubs and as a result they are severely stressed when any slight motion of the axle housing occurs. The inability of the axle shafts to align themselves properly out of stress under these conditions is the cause of numerous axle failures on buses.

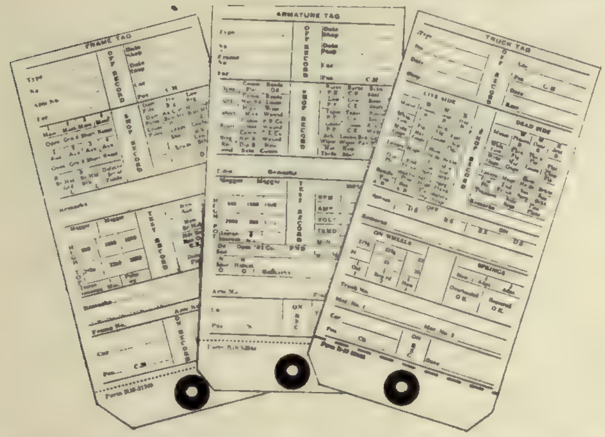
To overcome these difficulties, the San Diego Electric Railway has made a number of experimental axles of the full-floating type. These were placed in service, and after a satisfactory trial of twelve months manufacturers were asked to build them for us. However, to obtain the full benefits of the full-floating type of axle it was necessary to have special rear hubs to accommodate the shafts. It was found too expensive to purchase new hubs, so we proceeded to remodel our own. The old hubs were turned down at *A*, shown in the illustration, leaving a square space into which was shrunk an adapter ring with $8\frac{9}{16}$ in. outside diameter and $7\frac{1}{16}$ in. inside diameter. A drive plate was then clamped against the ring, centrally locating it with the base of the hub. The holes in the drive plate were used as a jig to drill the hub for the drive-plate studs. The studs penetrate into the adapter ring and into the hub, acting as a dowel. As an extra measure of safety a $\frac{1}{4}$-in. hole is drilled and tapped into the hub below the adapter ring. The spacer ring *B*, $8\frac{1}{4}$ in. outside diameter and $4\frac{1}{2}$ in .inside diameter, is cut with a torch from a $\frac{3}{4}$-in. plate and machined to size.

**Submitted in* Electric Railway Journal *Prize Contest.*

The new type of axle costs 8 per cent less than the old type, and by remodeling our old hubs we saved 60 per cent of the cost of purchasing the entire rear axle assembly. Service comparisons with the old type of axles were excellent. Axle shafts on the old buses had been breaking at the rate of six per year. One of the new type has been in service for 23 months without failure. We have had similiar gratifying results with later installations of this type. We are firmly convinced of the advantages of the full-floating axle shaft, and we are planning to install them as the old types fail.

*Tag System Gives Complete Record of Inspection and Repair**

By John W. Gruber
Design and Estimating Engineer
Pittsburgh Railways



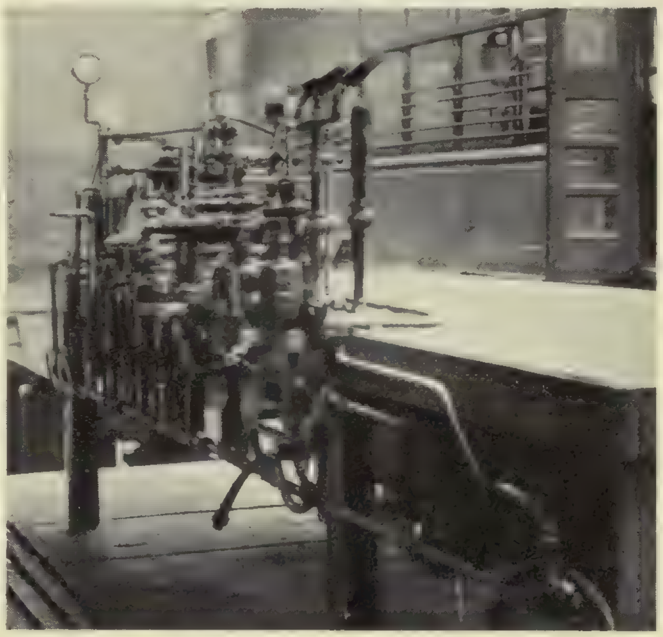
Tags for each class of equipment are punched by inspectors to indicate repairs to be made

RECORDS of inspection and repairs of motors and trucks at the Pittsburgh Railways are entered on tags, which relieves the inspectors of nearly all writing. For each truck, motor frame and armature repaired a separate tag, 3x$5\frac{1}{2}$ in., is used, as shown in the illustration. On the top of the tag is indicated the type and number of the part under repair, date, car number, position and carhouse. This information is filled in by the clerk when the car is taken to the shops. The clerk also indicates on the reverse side of the tag any unusual past record of the equipment.

The tags are sent to the inspectors, who attach them to the equipment. Each inspector has an identifying ticket punch for indicating the necessary repairs. The tag remains on the equipment until it is repaired and put back on the car, at which time the inspector fills in the date, car number and name of carhouse, and then returns it to the clerk. When the clerk receives the tag from the inspector, he enters all the information and files the card for future analysis and reference.

*Compressed Air Test Rack**

By C. B. Hall
Virginia Electric & Power Company
Norfolk, Va.



Many pneumatic valves are tested with precision by this rack in the Norfolk shops of the Virginia Electric & Power Company

PRECISION and convenience have been furthered in the testing of various pneumatic equipments entering into the operation of Birney safety cars by an ingeniously assembled compressed air test rack in the shop of the Virginia Electric & Power Company, at Norfolk, Va. The assembly consists of a shop-made bench measuring 12 ft. long, 4 ft. wide and 30 in. high, supported by scrap angle iron. The bench has a $\frac{1}{8}$-in. iron top and is fitted with a complete $\frac{1}{2}$-in. piping system, a replica of the actual operating equipment.

The complete pneumatic assembly is mounted on the bench and is connected to the shop air compressor. Five test gages are so arranged that they work in conjunction with a pressure regulating valve operating between two 16-in. tanks and an independent 10-in. tank. These tanks are placed beneath the top of the bench and furnish the desired pressures for the various tests. The piping is so arranged as to afford an individual pressure test for each unit, free of the co-ordinated operating set-up required in a car. The assembly was completed at an estimated cost of $100, and is finished in the shop color scheme of red, orange, green and blue. Tests have been made with precision and economy of time on brake valves, double check valves, emergency valves, relay valves, reservoir cut-off valves and door engines.

**Submitted in* Electric Railway Journal *Prize Contest.*

Sensitive Relays Require Careful Maintenance

By E. H. Carter
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

RELAYS play an important rôle in the correct functioning of electric railway car equipment. A relay which is not in good operating condition can be the source of a costly burnout or a serious delay. Too much emphasis cannot be placed on their proper maintenance.

Regular inspection and replacement of worn relay parts are necessary if trouble is to be avoided. On light inspection, conducting particles such as copper dust and brake shoe dust should be blown from the contacts and the insulation. Particles that cannot readily be removed with air can be wiped from the relay with a piece of cheesecloth. All main and control circuit connections should be inspected to insure tightness, and all moving parts checked for mechanical operation. The condition of the contacts should be noted, and any that are badly worn or burned should be replaced.

During regular overhauls, particular attention should be given to the mechanical parts of the relay. Wearing parts should be sparingly lubricated. All contacts, springs, disks, and wearing parts should be carefully inspected and replaced if they show signs of deterioration or serious wear. Insulating parts should be cleaned, and, if necessary, be given a thin coat of clean shellac. If the air gap or other adjustments which control the setting have been changed, the relay must be carefully calibrated so that it will pull in or drop out at correct voltage or current. These voltage and current values, of course, vary with the equipment. The maintenance men and inspectors should know these values and how the relays function.

Some common methods of adjusting the relay follow:

1. Vary air gap by change in position of core or armature.
2. Change tension of spring holding relay open or closed.
3. Adjust setting by varying calibration weight.

In setting relays it will be found of value to use a test lamp in series with the contacts. This lamp will light when the moving element is in the "make" position.

Improved contact disks, of metal graphite composition are now being used by many operators to replace the plain metal disks. These metal-graphite composition disks have a low voltage drop at the contact, and, therefore, can be operated at low contact pressure. Moreover, the contact drop with this disk is constant and does not increase due to oxidation. Lower contact pressure and constant contact drop result in longer life and reduced maintenance.

The function of the overload relay is to protect the main circuit apparatus by causing the line switch to open when a heavy current from an overload or short circuit occurs. A latch holds the relay in the tripped position until it is reset with the reset switch. The following points, therefore, are especially important:

1. Moving element should freely pull up at overload current.
2. Movement of armature should be quick and positive.
3. Armature should latch positively in trip position.
4. Closing the reset switch should drop the armature and prepare it for the next overload.

The overload relay can be checked both mechanically and electrically by setting the brakes and notching up the controller until the line switch opens. An ammeter connected in the main circuit can be used to check the value of the current at which the relay operates.

The line relay is a no-voltage relay and acts to cut off power when the voltage varies from fixed limits. As this relay must act very quickly to protect the equipment from momentary voltage surges, it should be very sensitive. Voltage drops may be due to poor contact on the trolley wire, section breaks, or defective frogs. When inspecting no-voltage relays the following checks should be made:

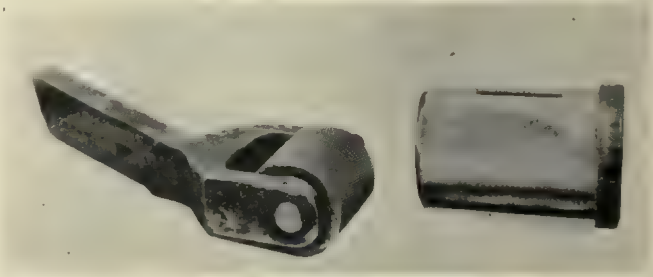
1. The moving element should drop very quickly when voltage is interrupted.
2. The air gap should be great enough when the relay is energized so that there is no danger of the residual magnetism holding the moving element.

The accelerating relay controls the acceleration of the motors by pulling open when the accelerating current is high and closing when it has decreased. For this relay the following points are important:

1. Adjustment should be maintained so that both pull-in and drop-out current values are correct for the equipment.
2. Wearing parts and contacts should be carefully inspected as the operation is frequent and the duty important.

*Reclaiming Undersized Motor Bearings**

By P. J. McQuade
Superintendent Shop Methods
Pittsburgh Railways



Knurling tool used by the Pittsburgh Railways to increase the outside diameter of worn motor bearings, and a sample of its work

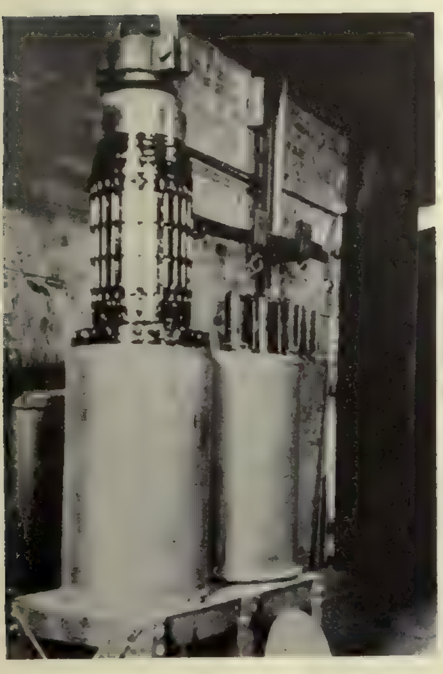
WHEN the outside diameters of bearings for the box-type railway motors of the Pittsburgh Railways have become so reduced on account of wear that they can no longer be pressed into the armature housings, they are reclaimed at the Homewood shops by knurling. By this method we are able to increase the outside diameter sufficiently to obtain a tight fit when they are pressed in the housings.

The bearing is driven by a fluted live center in the lathe and a conventional type of pipe center in the tail stock end. The knurling tool is, as a rule, passed over the bearing only once to obtain the desired increase in the outside diameter of the bearing. One bearing can be knurled in about four minutes. By the use of this tool we have been able to make a large saving in time and material, and the results obtained have been very satisfactory.

**Submitted in* Electric Railway Journal *Prize Contest.*

Reducing Failures of Rewound Armatures

By R. E. TWIGGS
Formerly Master Mechanic
Steubenville, East Liverpool & Beaver
Valley Traction Company
East Liverpool, Ohio



[At left]
Removal of armature coils is facilitated by soaking in a hot cleaning solution for several hours

[At right]
Baking of armatures and fields is done in an oven kept at a temperature of 212 deg. F.

DIPPING and baking have been found to increase the life of rewound railway motor armatures, and to result in fewer failures and reduced maintenance cost on the Steubenville, East Liverpool & Beaver Valley Traction Company. Since the present maintenance program was begun in 1927 there has been a steady improvement, and in the first eleven months of 1930 there were only eleven rewinds out of 300 motors in service. This compares with 34 rewinds in 1927.

Dipping and baking are done by standard methods. The baking is done in a thermostatically controlled oven which accommodates six armatures and 30 field coils, the temperature being maintained at 212 deg. F.

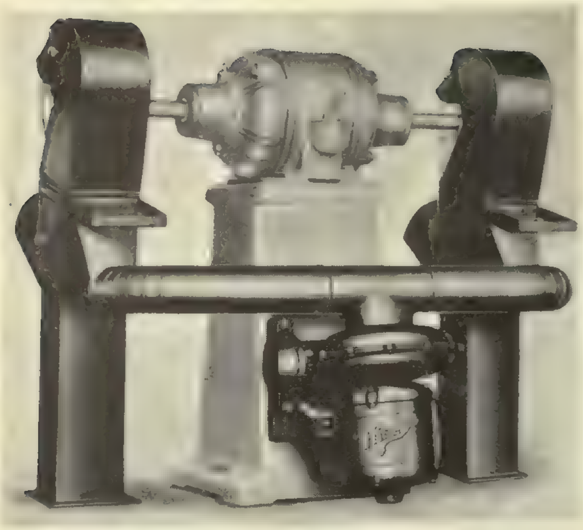
When the rehabilitation program was started early in 1927, the armatures were removed from the motors which had been in service for some time, given a megohm test, and then dipped and baked even if rewinding was unnecessary. Field coils were checked with a Century tester and any of them showing low insulation were removed. During that year 34 armatures were rewound, dipped and baked. The effect of this treatment was indicated by a reduction in rewinds toward the end of the year. In 1928 the remainder of the armatures were removed and tested. When a test of the field coils showed that one required attention, all four were removed and replaced with coils that had been dipped and baked. The results of the treatment were so pronounced that only nineteen rewinds were needed during the year.

As a result of the reduction in work of the armature department, the shops were reorganized in April, 1929. All overhauling of motors was transferred to the armature room and the foreman was placed in charge of all electrical repairs including brushholders, circuit breakers and line switches.

In order to have the cores in good condition for rewinding and to remove the old coils easily, the practice has been developed of placing the armature in a tank containing cleaning solution. The coil leads are first removed from the commutator slots and the armature is then submerged in the solution and the temperature held at 200 deg. F. for approximately three hours. After this treatment the coils are easily removed. The armature is again placed in the hot solution for additional cleaning, preferably being left over night at a somewhat lower temperature. In the morning the armature is removed and the core cleaned with wire brushes. It then has the appearance of a new armature. The labor for removing the coils and cleaning the armature is slightly more than 1½ man-hours, a material reduction from that with former methods.

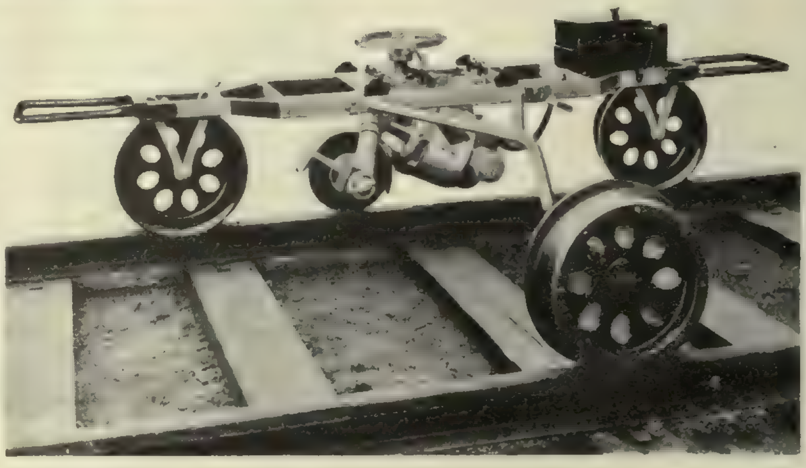
Results obtained with the cleaning tank have been so good that it has been decided to install a second tank, large enough to accommodate bus, motor and compressor parts in addition to axle caps and motor housings. The same tank is used to heat pinions before installing on the motor shaft, in order to eliminate trouble with loose pinions.

Use of these various devices has helped reduce the number of pull-ins. During 1927 there was an average of 47 pull-ins per month; for the first nine months of 1930 the average was only 24 per month. In September one of the company's shops did not have a single pull-in.



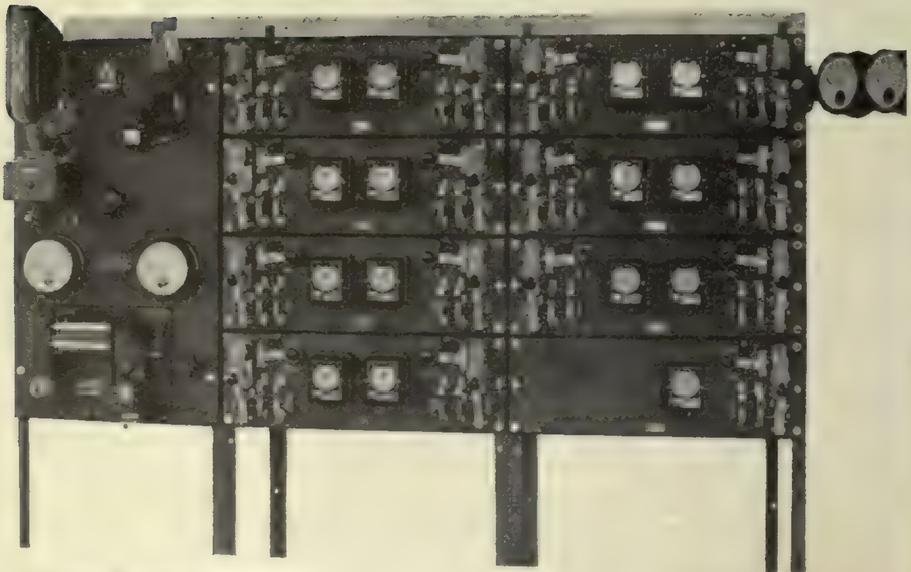
Recent Announcements of New Equipment

Buffing and Polishing Machine is equipped with an exhauster system, which is driven by a ball-bearing motor. One automatic motor starter simultaneously controls both motors. *Manufacturer:* Hisey-Wolf Machine Company, Cincinnati, Ohio.



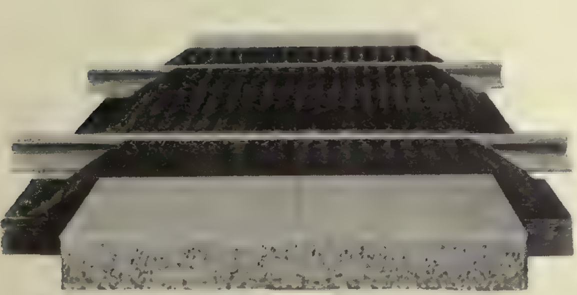
Rail Grinder, known as Model P-8, has a detachable outrigger, permitting two men to lift it off the track. As it occupies little space, the grinder can be placed alongside the track to permit the passage of cars. A flexible shaft attachment is provided for separating and leveling rail ends after welding. *Manufacturer:* Railway Trackwork Company, Philadelphia.

Wood-Block Flooring, available in oak, maple, beech and birch, is treated with transparent wood preservative for protection against decomposition, and against shrinking and swelling. A special heavy-duty block for herringbone patterns is made for industrial purposes. *Manufacturer:* National Wood Products Company, Howard City, Mich.

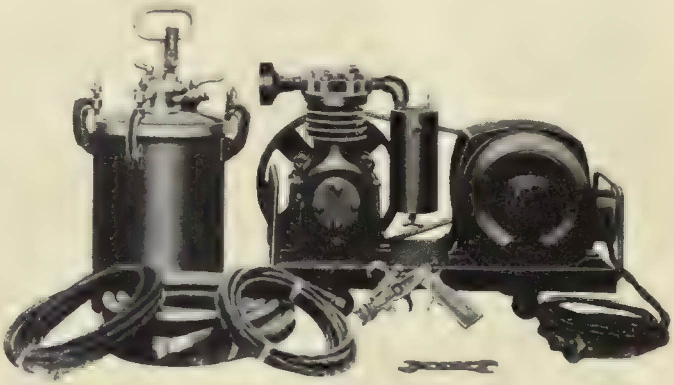


Automatic Control Panel has fifteen circuits for charging storage batteries with a 75-kw., 85-85-volt motor-generator set. A regulator holds the generator voltage within the limits of 3 per cent. The charging current is automatically adjusted to the correct value, depending on the state of discharge of the battery. The panel also affords protection against reverse current in case of failure of the alternating-current supply. *Manufacturer:* General Electric Company.

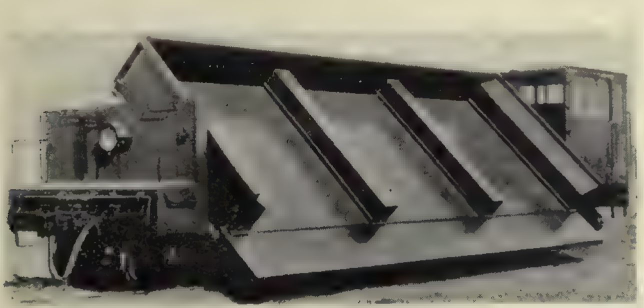
Demountable Truck Body is automatically loaded or unloaded quickly by a handling device attached to the chassis. . The coupling, stopping and locking operations are all automatic. One main lever controls the mechanism, and when thrown in engagement no further attention is needed. Device was invented by Austin Denehie, general manager of the Los Angeles Truck Exchange, Los Angeles, and it has not yet been placed in production.



All-Steel Foot Crossing is designed to eliminate the danger of pedestrians slipping or stumbling at sidewalk intersections. The foot crossing is constructed in three units. The units have flanged ends fitting snugly under the ball of the rails, and when placed in position they form a span level with the rails and the sidewalks. *Manufacturer:* Joseph T. Ryerson & Son, Chicago.

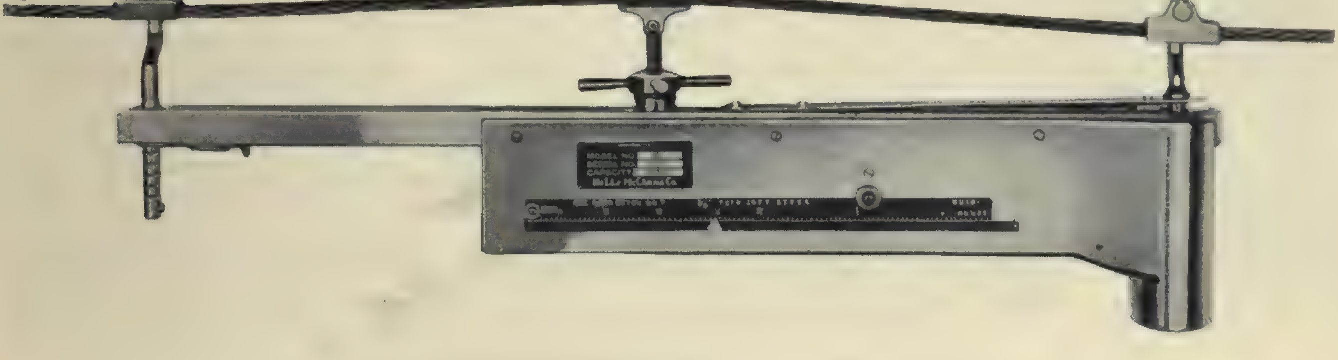


Spray-Painting Outfit is light in construction so that it can be carried about and operated by one man. It is equipped with a ⅓-hp. motor, one pressure-feed paint tank, 20 ft. of 5/16-in. air hose and connections, and 12 ft. of 5/16-in. fluid hose and connections. *Manufacturer:* DeVilbiss Company, Toledo, Ohio.



Gas-Electric Dump Car has a 24-yd. level-load dump body with a capacity of 35 tons. The car is equipped with two gasoline engines, rated at 155 hp., and two generators and four motors by Westinghouse. The air-brake equipment is Westinghouse, straight and automatic. *Manufacturer:* Differential Steel Car Company, Findlay, Ohio.

Tensiometer is built for service in the field. It can be hooked on the wire in any position, and deflects the wire by tightening the center bearing. A correct reading of the tension in the wire is given at once. The device is inclosed in an aluminum case, weighing 14 lb. The standard model will test all wires up to 1 in. in diameter, and has a tension capacity of 16,000 lb. *Manufacturer:* Hills-McCanna Company, Chicago.



NEWS *of the Industry*

Improvement Projects

Philadelphia, Pa.—Closing two years of struggle on the part of Northeast representatives, Councilmen decided on June 24 upon the direct subway line to Rhawn Street under Roosevelt Boulevard—a project estimated to cost ultimately $29,000,000.

✦

Beverly Hills, Cal.—The Pacific Electric Railway has been authorized by the Railroad Commission to relocate and reconstruct its tracks at grade across Rodeo Drive, Camden Drive, Bedford Drive, Roxbury Drive, and Linden Drive here to improve operating conditions and lower the grades of approach.

✦

Baltimore, Md.—The United Railways & Electric Company has completed its present new car and rebuilding program under which 150 new cars and 155 rebuilt articulated and double-truck cars have been added to the quota of equipment.

✦

St. Louis, Mo.—The State Highway Commission has asked the Public Service Commission to order the St. Louis Public Service Company to participate in the elimination of a grade crossing in St. Louis County at a point where State Highway No. 77 intersects the tracks of the railway. The commission estimates that the proposed viaduct will cost $25,985, and the commission is asked to make the State and the railway each responsible for half the cost.

✦

Seattle, Wash.—Work on the extension of the Municipal Railway into the Denny Hill regrade area at a cost of $57,000, which was to have been started in June, will not begin until Aug. 1.

✦

Memphis, Tenn.—Mayor Overton and W. D. Kyser, president of the Memphis Street Railway, have tentatively agreed to remove the car tracks and neutral strip from Lamar east of the intersection with Central Avenue, and erect a new trolley wire system from the Parkway west on Lamar and Vance Avenues all the way uptown preparatory to the installation of trolley bus service. If satisfactory arrangements can be worked out, the railway will immediately order six trolley buses at a cost of $14,000 each, service to start Sept. 1.

Fare Changes

Long Island City, N. Y.—The Transit Commission has granted the New York & Queens County Railway permission to charge a 6-cent fare on its lines until December 31, next. The commission's action was necessary as the company's right to charge a 6-cent fare expires June 30, next. The commission approved a resolution prepared by Commissioner Lockwood providing that the revenues from the 1-cent additional fare be segregated.

Modified Toledo Grant Before Voters on Aug. 11

Revision of the Milner service-at-cost ordinance in Toledo has been approved by the City Council and the new measure will be placed on the ballot for action by the electorate at the city primary on Aug. 11. In that it embodies several new principles, the document contributes to the service-at-cost idea. Section by section, it was approved by the Railroads Committee of the City Council, and then passed with one dissenting vote.

The measure renews the original grant of the Community Traction Company for ten years, and brings motor coaches specifically under the ordinance. A new factor is a clause which gives the company a real incentive to economical operation.

In place of the former provision of a general sinking fund for retirement of bonds and preferred stock equal to 1 per cent of the company's entire capital value for each year of renewal, the new franchise provides that the surplus of receipts after meeting expenses, maintenance and repair fund, depreciation fund, sinking fund requirements on new capital, and interest on bonds and dividends on preferred stock accruing after the date of the renewal, shall be divided so that 70 per cent goes into the stabilizing fund and 30 per cent into the general sinking fund applicable to the bonds and preferred stock of the company.

As economies to the public are reflected only through the balance in the stabilizing fund, it is apparent that to retire capital the major portion of the net receipts after all fixed requirements must go into the fare savings. The greater the fare savings the greater the amount for amortization of invested capital.

The new ordinance assures the company a monopoly of transportation service within a quarter-mile of any of its lines.

The city may require extensions and fix service standards on existing lines subject to arbitration provisions intended to safeguard the company from the imposition of unduly burdensome orders.

Limits of the depreciation fund formerly fixed between ½ and 1½ per cent, but in practice always carried at 1½ per cent, have been raised to 1½ to 4 per cent. Special limits for depreciation of bus properties are set at 10 to 25 per cent.

Accounting for bus operation must be in accord with the American Electric Railway Association standards and for railway operation in accord with Interstate Commerce Commission practice.

Flexibility in fares is assured. The maximum fare for school children through the high school period is to be 5 cents, a 1-cent fare is to be charged for those under eight years, and there are to be weekly passes and optional Sunday fares, but the regular scale is to be the same as that in effect in the old ordinance. The fare now is 10 cents cash or three tickets for 25 cents with a 1-cent transfer charge.

(Continued on Page 381)

Coming Meetings

July 16-18 — Mid-West Electric Railway Association, Brown Palace Hotel, Denver, Col.

Aug. 6-8 — Pacific Claim Agents Association, Stockton, Cal.

Aug. 13 — Transportation Section, Wisconsin Utilities Association, Hotel Retlaw, Fond du lac, Wis.

Aug. 14—Annual Convention, Wisconsin Motor Coach Association, Hotel Retlaw, Fond du lac, Wis.

Sept. 9-10—Central Electric Railway Master Mechanics' Association, Cincinnati, Ohio.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Jan. 27-29, 1932—Electric Railway Association of Equipment Men, Southern Properties, Richmond, Va.

Fewer Cabs and Trucks in Chicago

A recent traffic survey in the downtown area of Chicago indicated that more Chicagoans are driving their automobiles to work than did so during more prosperous times two years ago, according to Leslie J. Sorenson, city traffic engineer.

The survey, made by the police on May 26, shows that the number of taxicabs entering the downtown district has fallen off 21 per cent from the volume of 1929, and that the number of service vehicles and trucks has decreased 7 per cent.

The police counted 145,939 vehicles from 7 a.m. to 7 p.m., an increase of 4 per cent over the 139,891 counted on a similar occasion in 1929. Passenger vehicular traffic increased 15 per cent, from 88,439 to 101,831.

Wisconsin Associations to Meet at Fond du Lac

It has been decided to hold the transportation section convention of the Wisconsin Utilities Association on Aug. 13, and the annual convention of the Wisconsin Motor Coach Association on Aug. 14 at Fond du Lac, Wis. There will be a banquet for the combined groups on the evening of Aug. 13 at the Hotel Retlaw.

Art and Utility Combined in Ice Delivery Car

Distributing ice is no less a public service than is transportation

The Kentucky Traction & Terminal Company, Lexington, Ky., managed by the Kentucky Utilities Company, along with the Lexington Ice Company, another Insull subsidiary, has installed a special refrigeration car for hauling ice from the plant of the Lexington Ice Company to ice stations located on the lines of the Kentucky Traction & Terminal Company, at Georgetown, Paris, Nicholasville, and other points. This car, a reconstructed and insulated freight car, has large carrying capacity. It is very attractive in white, with black lettering and black running gear. Signs on both sides in big black letters read: "Pure Ice Protects Food," and "Use Ice the Year Around." Over the ice door openings of the car is a small sign: "Lexington Ice Company," while on the molding at the top of the car there appears in small letters: "K. T. & T. Company." The uniforms of the crews are white.

◆

Substitution of Service Still Unsettled in St. Louis

Attorneys for the St. Louis Public Service Company on June 8 filed with the Public Service Commission a brief in support of the company's plea to withdraw its Tower Grove and Bellefontaine lines from Gravois Avenue. The city is widening Gravois Avenue between Grand Boulevard and Twelfth Boulevard to a 100-ft. thoroughfare. The cost to the company to relocate tracks on Gravois between Arsenal Street and Mississippi Avenue in the center of the widened street is estimated at $113,000. The present tracks are in good condition and should be serviceable for many years. Undoubtedly the widened street will attract additional auto traffic and make railway operation on the street more hazardous. The company would install a fast through bus service on Gravois Avenue, but street car riders in the districts affected by the changes have voted overwhelmingly in favor of the rerouting of the Tower Grove and Bellefontaine lines and the installation of bus service on Gravois Avenue to the downtown district.

Burden of Amortization Out of Earnings Too Great

Price Waterhouse & Company has been auditing the books of the Detroit Municipal Railway for several months. It is expected that the report, to be presented within a few weeks, will recommend changes in the bookkeeping methods of the system. W. B. Bonthron, head of the company's Detroit offices, conferred with the street railway commission and Mayor Murphy recently, and urged changes in the allocation of depreciation charges. Mr. Bonthron is understood to feel that the D.S.R. for the past eight years has been paying off its debt too rapidly. He urged the commission to decide whether the charter should be amended to eliminate the provisions which require the eventual payment of all debts. Clarence E. Wilcox, corporation counsel, said that Senator James Couzens, under whose administration as Mayor municipal ownership was brought about, was of the opinion that a reasonable permanent debt was in accord with the tenets of sound finance.

Baltimore Railways Truck Fleet

The champion safety truck fleet of Baltimore is the United Railways' fleet of 37 trucks. This fleet, operated by 51 drivers, won the Baltimore Safety Council's award in the public utility truck division for the best six-month safety record from July 1, 1930, to Jan. 1, 1931. The trophy is a bronze plaque. Replicas of it have been painted on the sides of all the United Railways' trucks in the winning fleet, and every man has been presented by President Storrs of the railway with a trophy pin.

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Dallas Men Feted for Safety Records

With words of praise for their splendid records and efficient service during 1930, officials of the Dallas Railway & Terminal Company entertained at a banquet held recently 26 trainmen who had perfect service records. Two outstanding men, one from each division, A. Trotter, Oak Cliff, and J. C. Haislip, East Dallas, were selected from the group for the annual award, a 21-jewel Ball watch. Every man present received a purse and card case engraved: "For Efficient Service." The two outstanding men were selected by G. I. Plummer, assistant general manager in charge of transportation, with the aid of the entire supervisory force of the transportation department. This is the second contest of the kind sponsored by the company. Last year Fred A. Hafner, of the Hafner Watch & Optical Company, and the Ball Watch Company were donors of the efficiency award. At that time 37 men had perfect safety records over a period of five months. So pleased was the railway with the outcome of this contest that it decided to make the award an annual affair and extended the contest period to one year. Mr. Plummer said:

> We have found the efficiency contest to be one of the most outstanding things we have done in the interest of safety. It is a great honor for a man to be recognized as having passed an entire year with no charge of any kind against his record.

High tribute was paid by the railway officials to those present for their splendid co-operation. Service records of Mr. Trotter and Mr. Haislip date back to Oct. 9, 1894, and Aug. 31, 1922, respectively.

Twenty-six Dallas trainmen who completed year of service with perfect work

Bus Operations

Washington, D. C. — Street car type buses that replaced car service on the west end loop of the Capital Traction Company are showing favorable operating results. Traffic on this line is light and it was decided to substitute the buses since track reconstruction work costing $370,000 would have to be carried out in connection with a street improvement program by the city.

◆

Johnstown, N. Y.—Operation of buses by the Fonda, Johnstown & Gloversville Railroad between Fonda and Fort Johnstown, has been authorized by the Public Service Commission, but does not contemplate discontinuance of trolley service on any portion of the route.

◆

Springfield, Ohio—Institution of bus service to replace the former trolley service on the East High Street and Belmont divisions of the Springfield Railways may lead to the barring of all parking in the congested area. The new service was started on June 22, the last cars operating over the divisions on Saturday night. The new service is the result of an agreement between the city and the company, and is to be effective until a permanent solution of the transit problem is reached.

◆

New York, N. Y.—The Board of Estimate and Apportionment has set July 10 for a hearing on applications for bus franchises in Queens. The board, it was indicated, has selected tentatively as operators of the routes the North Shore Bus Company and the Jamaica Bus Company, Inc., subsidiary of the Jamaica General Railways.

◆

Frostburg, Md.—The Cumberland & Westernport Transit Company has sent three affidavits to the Public Service Commission charging that the Lashley & Anderson Bus Company carried those making the affidavits from Westernport to Cumberland, and from Keyser to Cumberland in contravention of an order handed down by the commission directing it not to receive passengers in Westernport for Cumberland or in Cumberland for Westernport. The Cumberland & Westernport Transit Company secured the permits under which it is now operating buses from Westernport to Cumberland to protect business it handled for more than 30 years with trolley cars from Westernport to Cumberland by way of Frostburg.

◆

Vancouver, B. C.—On motor buses the British Columbia Electric Railway has recently reiterated its stand that "wherever there is a field for the motor bus we will use it, but our knowledge of transportation tells us emphatically that the street car is the best possible vehicle for transporting the 200,000 daily passengers in the city of Vancouver."

◆

Hudson, N. Y. — The Public Service Commission consented on June 24 to the transfer to Paul Hirschman of the certificate of public convenience and necessity for the operation of buses here and in the town of Greenport, issued to the Eastern New York Transportation Corporation. Mr. Hirschman has operated a bus line from Hudson to Philmont for fifteen years, and he owns and maintains a garage in Hudson and has six buses. The same rate of fare now charged, which is 10 cents cash, or thirteen tokens for $1, will continue in effect, and all outstanding tokens will be honored. The Philmont line will be operated independently of the local line. The bus company sustained a loss of $5,000 during the past year, but Mr. Hirschman expects that he will be able to overcome this by intensive personal management. The Eastern New York Transportation Company was owned by the Eastern New York Utilities Corporation, which has been dissolved.

◆

Washington, D. C.—Operation of the new taxi-coach has been started in Washington by the Capital Traction Company through a special arrangement with the Twin Coach Corporation. The coach has been in use on the Chevy Chase de luxe bus line, with very favorable public reaction. In the case of the Capital Traction Company, it has been found that the taxi-coach makes better speed than the conventional type of parlor bus.

◆

Corning, N. Y.—The transfer of certificates of convenience and necessity issued to Frederick N. Carpenter for the operation of bus routes from Corning, to Waverly, and in Corning and between Painted Post and South Corning, to Carpenter's Rapid Transit, Inc., was approved on June 24 by the Public Service Commission. These bus lines replace service formerly rendered by the Corning & Painted Post Street Railway and the Elmira, Corning & Waverly Railway, which abandoned operation some time ago.

Service Changes

Chico, Cal.—The Sacramento Northern Railway has applied to the California Railroad Commission for authority to discontinue local service here. It operates a line along Park Avenue, Main Street, and the Esplanade, and a stub line, extending from Park Avenue to the plant of the Diamond Match Company.

New York, N. Y.—The Transit Commission has granted permission to the Union Railway, a subsidiary of the Third Avenue Railway, to establish 24-hour one-man car service on its 163rd Street Crosstown, Boston Avenue and Tremont Avenue lines, now operating one-man cars only part of the time.

◆

Buffalo, N. Y. — The Public Service Commission on June 17 directed the International Railway to submit plans to provide increased protection at wyes where one-man cars are operated. Action followed complaints by the Mayor of Buffalo and the Mayor of Lackawanna in which it was alleged that operation of the one-man cars at wyes is dangerous to the public because cars must back across walks used by the public when turning on the wye tracks. The Buffalo Council adopted an ordinance requiring the railway to station another man at the wyes when cars are being turned, but the court held this illegal since authority to regulate street car operation rested with the Public Service Commission.

◆

Cleveland, Ohio.—The Street Railway Commissioner has submitted to Council a plan for loading cars of the Cleveland Railway from the sidewalks on Public Square, by reversing the direction of the cars around the loops.

◆

San Jose, Cal.—In a supplemental order the Railroad Commission has authorized San Jose Railroads and Peninsular Railway to abandon and remove their tracks on Willow Street between McClellan Avenue in San Jose and Lincoln Avenue in Willow Glen, provided that the Peninsular Railway give service over the track in Lincoln Avenue between Willow Street and Minnesota Avenue. The Peninsular Railway is also authorized to construct a connection and crossing at the intersection of Willow Street and Lincoln Avenue in Willow Glen, to provide a connection between the track on Lincoln Avenue to the north of Willow Street, with the track in that avenue south of Willow Street.

◆

Wheeling, W. Va. — Withdrawal of service by the Wheeling Traction Company between Shadyside and Bellaire has been announced.

◆

Richmond, Va.—A faster schedule on the Petersburg, Hopewell & City Point Railway has been arranged. Cars now leave Petersburg and Hopewell every 30 minutes from 12:30 to 9:30 p.m. The running time has been cut ten minutes.

◆

Tacoma, Wash.—The Sumner-Tacoma Stage Company has asked the Department of Public Works for permission to route some of its buses via the tideflats so as to meet a demand for transportation from workers on the tideflats who live in the lower Puyallup Valley district. The city contends that such service would affect the revenues of its municipal belt line street railway.

◆

Baltimore, Md.—Conductors of the Washington, Baltimore & Annapolis Electric Railroad are now permitted to sell round-trip tickets on its trains. In the past conductors could only accept single-way fares.

Manufacturers

CONFIDENCE breeds COURAGE
COURAGE breeds ACTION

Get the first, the others will follow.

You can't come out of a dark room and see, *immediately*. You can't come out of a depression and *sense* the future, in a day. In both cases

You Can Have Confidence.

Having that, *Courage* and *Action* follow.

GET CONFIDENCE KEEP CONFIDENCE
SHOW CONFIDENCE

by exhibiting at the

50th A.E.R.A. Convention

at Atlantic City next September

You are invited.

THE EXHIBIT COMMITTEE.

Midland United Gets Indiana Interurban

Properties of the Terre Haute, Indianapolis & Eastern Traction Company were sold at public auction on June 23 by Elmer W. Stout, receiver, acting under orders of Judge Ryan of the Marion Superior Court and subject to confirmation by him.

B. P. Shearon, secretary of the Midland United Company, Chicago, was the only bidder at $2,500,000, the minimum price set by the court. Bonds in the amount of $500,000 were deposited with the receiver as first payment for the properties.

Since Mr. Stout was appointed receiver on April 21, 1930, service on approximately 170 miles of leased lines has been abandoned. A petition to abandon an additional 61 miles of track between Indianapolis and Richmond is still pending before the Public Service Commission.

In July last year, the Midland United Company made an offer to purchase the $4,816,000 of T.H.I. & E. first mortgage bonds at a price of 73, or for the sum of $3,612,000. The offer was accepted by the bondholders' protective committee and 90 per cent of the bonds are now owned by the Midland United Company. Ownership of these bonds gives the Midland company control of the common stock of the Terre Haute Traction & Light Company, which is pledged as collateral security for the bonds. The latter company furnishes electric light and power and local railway service in Terre Haute.

With control of the T.H.I. & E. obtained by the Midland United Company it is likely that the line will soon become a part of the Indiana Railroad System, representing the co-ordinated operation of four other Indiana interurban lines controlled by the Midland company. Interurban properties included in the T.H.I. & E. purchase are the 72-mile line from Indianapolis to Terre Haute and the Indianapolis-Richmond line. Local railway systems in Terre Haute and Richmond were also obtained.

Plans for Indianapolis Reorganization Advanced

Plans for the reorganization of the Indianapolis Street Railway have been approved by Indianapolis members of the Security Owners' Protective Committee and copies have been sent to other members of the committees for consideration and approval. Indorsement of the proposal by the full membership is expected before July 1.

The new reorganization plan, as recently reported in Electric Railway Journal News, would scale down the present outstanding securities from $18,881,000 to $10,134,000, and reduce the fixed charges from $811,614 annually to $459,200.

The plan also contemplates reconstruction of much of the company's trackage, purchase of 338 new street cars, gasoline buses and trolley buses, which would be paid for out of the company's earnings or through issuance of first mortgage bonds that would assume priority over all other securities.

Approximately $1,300,000 will be invested in the new company by the present holders of junior securities. It also is probable that $2,000,000 of first mortgage open-end bonds will be issued if it becomes advisable or necessary to do so. The bonds, however, will not be issued in exchange for securities of the present company.

Enough securities already have been deposited with the committees to insure the success of the plan. The name of the reorganized company would be Indianapolis Railways, Inc.

Modified Toledo Grant

(Continued from Page 378)

The power contract with the Toledo Edison Company, extending to Feb. 1, 1941, is continued in the renewal. The rate is 1.25 cents per kilowatt hour.

Under the memorandum of agreement by which amortization was postponed on Feb. 1, it was agreed that half of the $812,500 of notes given in July, 1928, when the bus ordinance was made effective, evidencing current obligations, will be cancelled by the interests holding the bonds.

Prospects point to the renewal ordinance having the support of general business interests, the press and most civic organizations.

Local Bus Service by Interurban

The Indianapolis & Southeastern Railroad has introduced local bus service between Aurora, Ind., and Cincinnati, Ohio, replacing electric railway operations abandoned last winter by the Cincinnati, Lawrenceburg & Aurora Electric Railway. The new bus schedule provides ten round trips daily, serving the intermediate towns of Lawrenceburg, Elizabethtown, Cleves, Zion, Mack and Cheviot. The local service between Cincinnati and Aurora is in addition to the company's through service from Cincinnati to Bates, Greensburg, Shelbyville and Indianapolis. Two new 21-passenger city type Dodge motor coaches have been purchased by the Indianapolis & Southeastern for service on its Cincinnati suburban line serving Fernbank, Cleves and Hooven, Ohio, in conjunction with the Cincinnati Street Railway.

The Business Outlook

THE swift, sweeping reversal of psychology in world security and commodity markets has suddenly exposed the paralyzing doubt and deflationist dogma that have dominated and unduly prolonged this depression. This surge of speculative sentiment in the past week swamps the slow, stagnant statistics of business activity with steel, carloadings and even check transactions sagging under summer slackness. But prices have become the key to recovery, and the scramble to get on the bus is likely to leave business indicators behind for a while, unless the overloaded vehicle tries to take the steep hill. In short, American business appears to be bound back to the high road from its deflation detour. All that is needed now is a little financial free-wheeling.

—*The Business Week.*

Well Diversified Programs Arranged for Mid-West Meet

Announcement has been made of the program for the business sessions of the meeting of the Mid-West Electric Railway Association and the Mid-West Claim Agents Association at the Brown Palace Hotel, Denver, Col., July 16 and 17. The meeting will be opened at 9:30 a.m. on July 16 by President C. A. Semrad. Mayor Begole will welcome the delegates. Following Mr. Semrad's response two papers are on the program: "What Mass Transportation Means to a City," by Charles Gordon, managing director of the American Electric Railway Association, and "Psychology of Employee Relation," by F. G. Buffe, vice-president in charge of operations, Kansas City Service Company.

At 1 p.m. there will be round-table luncheons of the equipment section and the claims association and one for the consideration of general topics. The sponsors are R. W. Bailey, M. B. Bracken and Robert P. Woods. The claims luncheon topic is "Standardization of Claims Statistics," by C. I. Carr.

The afternoon topic of the Claims Association is "Claim Policies," a discussion in which it is expected all members will participate.

The session on July 17 will convene at 9:30 a.m. The topics are "Merchandising and Advertising Transportation," "Street Traffic Problems," and "Field Tap Control by Use of Resistors and Its Effect Upon Speed and Motors." The speakers are Lawrence Wingerter, Des Moines Railway; F. C. Lynch, director Kansas City Safety Council, and A. P. Cox, General Electric Company. At the morning session there will be an address by M. E. Simonds, commercial vice-president of the Westinghouse Electric & Manufacturing Company.

At the joint luncheon the topic will be "Safety, Speed, Service," by C. A. Porter, vice-president and general manager, Omaha & Council Bluffs Railway.

After the luncheon session the topic will be "Up to the Minute Trolley Bus Construction and Operation," by C. G. Guernsey, automotive division of the J. G. Brill Company.

Other topics are:

"Operating Features and Problems of Trolley Buses."

"Trolley Bus in Smaller City Operation."

These topics will be presented respectively by E. A. West, general manager Utah Light & Traction Company, and A. T. Lewis, manager of transportation department Central Illinois Electric & Gas Company, Rockford.

Since Denver is in many respects a show city, an elaborate program of entertainment has been arranged. This includes sightseeing trips, luncheon and bridge, banquet and dance and special reception for the ladies.

Rerouting in Business District Essential

Answering the criticism of downtown business men who have objected to his suggestions that certain lines of the St. Louis Public Service Company entering the downtown district of St. Louis, Mo., should be rerouted, R. F. Kelker, Jr., transportation adviser of the St. Louis transportation survey commission, in a memorandum presented to the aldermanic committee now studying the report, has defended his recommendations. He said that it must be remembered that in supplying transportation to a business district, all of the street cars necessary to meet traffic demands of the district cannot be routed over a few tracks in the district or traffic congestion, and eventually stagnation, will result. He contended that the changes suggested in the report will provide more convenient and easier ingress to and agress from the downtown district and will check decentralization of the business district.

◆

Egyptian System Tied to Illinois Traction

The Illinois Commerce Commission has approved the transfer to the Egyptian Motor Lines, Inc., of all of the bus lines, certificates of convenience and necessity of the defunct Egyptian Transportation System, Inc. The new company will operate a 500-mile network of bus lines in northern, central and southern Illinois. Recently the property of the Egyptian Transportation System was sold at foreclosure for $160 000 to representatives of the North American Power & Light Company. It is anticipated that the newly formed Egyptian Motor Lines, Inc., will operate in close co-operation with the Illinois Traction System, Illinois Power & Light Corporation and other companies affiliated with the North American Power & Light Company.

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Maryland Measures Subject to Referendum

The bill passed at the recent session of the Maryland Assembly and signed by Governor Ritchie exempting the Washington, Baltimore & Annapolis Electric Railroad, now in receivership, from the payment of taxes during the next two years will have to be approved by the voters before it can become effective. It will be impossible for the voters to act on the subject until the Congressional election in 1932. In the meantime, the law will be inoperative. Passage of the bill was sought as a means of helping to keep the line in service. Numerous other economies have been effected. Opponents of the measure have filed with the secretary of state a referendum petition containing the required number of signatures and the measure must now be placed on the ballot at the next election. Filing the petition prevents the law from becoming effective pending action by the voters.

Similarly, a petition has been filed with the secretary of state for a referendum on the bill passed by the last session of the General Assembly requiring taxicabs in all cities of more than 50,000 inhabitants to be equipped with meters and carry liability insurance, and also placing them under the regulation of the Public Service Commission. The petition will have the effect of keeping the law from becoming operative unless it is approved by a majority of the voters. The law was to become effective on June 1, but was not to be enforced until Jan. 1, 1932. Under the referendum law, the voters cannot act upon the measure until the Congressional election in 1932.

Financial News

Louisville, Ky.—The Louisville Railway handled a very excellent volume of business during May. Attendance at the spring racing season here, which opened on May 2 and closed on May 23, and included the Kentucky Derby on May 16, was smaller than for the banner years, but this year more people used the street cars than last year. Excellent traffic arrangements prevailed on Derby Day, making it possible for the street cars to make excellent time. Immediately after the Derby, the fifth race, thousands started to leave but a steady line of street cars moved into position to load and traffic was handled with a minimum of delay with excellent co-operation on the part of the police department. Prior to the completion of the Fourth Street underpass beneath the tracks of the Southern Railroad and Louisville & Nashville Railroad, completed a year ago, street cars frequently became bunched at this intersection.

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Iowa City, Ia.—A decree for the sale of the assets of the Iowa City Railway has been issued by Judge Harold Evans, with Aug. 1 set as the date for consideration of bids.

Regulation and Legal

Tallahassee, Fla.—The State Senate on June 23 defeated a bill that would have made the tax on gasoline in Florida 8 cents a gallon. The measure, sponsored by the administration, proposed an excise tax of 2 cents a gallon in addition to the 6-cent tax prevailing.

Richmond, Va.—Governor Pollard is being deluged with requests urging appointment of specified individuals to his proposed commission to study problems of bus and truck taxation, and the motor vehicle laws in general. The executive said that he might alter his plan because of the difficulty of finding a commission entirely free from prejudice, and that instead he might have heads of the motor vehicle, highway, tax and finance departments of the State hold hearings at which proponents and opponents of motor bus transportation might be heard.

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Buffalo, N. Y.—The State Court of Appeals has denied the International Railway permission to appeal from the ruling that it must pay for the cost of repaving abandoned track areas. The decision covers only the tracks and pavement in Best Street between Elm and Genesee Streets. The International took the position that it was willing to remove rails from streets on which it has obtained permission to abandon service, but that it should not be required to repave track areas.

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Winnipeg, Man.—The Winnipeg Electric Company has informed the city finance committee of its inability to pay the 5 per cent gross earnings tax on its railway for 1931. In turn, the committee instructed the city solicitor to ascertain whether the company intended to discontinue rights and privileges enjoyed under the franchise agreement, and the company replied that it intended to pay 1930 indebtedness, but financial condition of the tramway prevented it from meeting this year's obligations.

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Harrisburg, Pa.—The new motor and tractor bills, and a measure taking over 300 miles of second and third-class city streets on main State highways by the Highway Department were approved on June 23 by Governor Pinchot. The motor code is effective Aug. 1. It empowers Philadelphia, Pittsburgh and Scranton to enact ordinances for the impounding of automobiles parked contrary to their regulations. Under the new act, storage garages can be designated as pounds. The municipal ordinances must fix specific towing and storage charges. The owner of an impounded vehicle must be notified within twelve hours that the vehicle has been impounded.

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Oklahoma City, Okla.—The City Council has voted down a motion to file suit before the Corporation Commission against the Oklahoma Railway asking for a reduction of fares. Kent Shartel, for the company, stated that the company is entitled to a profit of approximately $900,000 a year, but that last year the return was negligible.

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New York, N. Y.—The detailed report of the Transit Commission's engineers and accountants on valuation of B.-M.T. and Interborough Rapid Transit properties to be included in a unification plan, both on original cost and reproduction cost bases, was made public on June 20. It was embodied in a 518-page printed volume containing hundreds of tables, charts and financial statements relating to both companies and showed in minute detail how the statutory reproduction cost of $503,540,205, marking the maximum price which the city can pay for the properties under the Public Service Law, was fixed.

The P.R.T. Dividend

While it is true that the abrogation of the Mitten Management contract, the cancellation of the Mitten Building lease, the substitution of one requiring a lower rental and other changes resulting from the McDevitt adjudication and the agreement following that judgment have placed additional financial resources at the disposal of the directors of the Philadelphia Rapid Transit Company, the period of their control has been too short for a final determination of the precise financial status of the corporation. It is to be noted that the announcement is that the dividend has been "deferred," not "passed," hence the shareholders—and this includes, although indirectly, the employees of the P.R.T.—may be justified in hoping that the dividend payments have only been postponed and will be made at a later date.

—*Philadelphia Public Ledger.*

Commission Counsel Explains New York's New Motor Bus Law

New York State's new law governing the operation of bus lines was explained in an address delivered on June 10 by Col. Charles G. Blakeslee, counsel to the Public Service Commission, before the New York State Conference of Mayors, in session in Glens Falls. Colonel Blakeslee explained that the new statute has clearly defined the commission's authority and eliminated uncertainty that existed previously.

Colonel Blakeslee said the authority of the commission in the past has been so indefinite that it urged upon the Legislature year after year the necessity of some law which would fix proper jurisdiction and control, but that for one reason or another no bus bill became a law until the passage of the act which as Chapter 531 became effective on April 21 of this year.

So far as the new 1931 law affects the powers of local authorities in controlling bus operation, the act confirms many rulings and regulations previously made by the commission in the absence of statute. In addition, it makes certain radical changes, the principal one being that a distinction is made between bus lines operating in a single municipality and those operating over routes which serve two or more communities. No changes are made in existing law relative to operation within the confines of one municipality, the local authorities being confirmed in their jurisdiction over such lines, but as to the longer lines the new procedure is provided.

In the past where a bus line was projected to furnish service between communities, and secured the necessary local consents from a majority of the communities, the entire project might have to be abandoned if a single community refused its consent. Under the operation of the new law this cannot happen.

The new law, said Colonel Blakeslee, permits the commission to:

1. Supervise omnibus corporations; inspect and examine their equipment; require reports of accidents and investigate the same; prescribe rules and regulations for operations and for safe and adequate equipment.
2. Require filing of annual reports; the furnishing of such information as at any time is necessary; prescribe the methods and form of keeping books and accounts; and when engaged in other or additional business, to keep separate accounts.
3. Fix just rates and prescribe rules for the printing, filing and publishing of tariff schedules; hold investigations and hearings and suspend proposed rates and fix temporary rates when necessary.
4. Approve the issue of stocks, bonds, notes and other securities of a bus corporation, and permit the issuance of securities for reimbursement of treasury during a ten-year period; authorize the reorganization of bus corporations and approve agreements for the same.

Free Rides in El Paso

Free transportation on cars and buses of the El Paso Electric Company has been offered for the past four years by the Popular Goods Company, El Paso, Tex., to induce customers to attend the opening day of the anniversary sale. Gratifying results have always followed. The store began its 29th anniversary sale on May 29, and passengers on all inbound cars and buses rode free as its guests between 8 and 10 a.m.

The power plant switch was pulled for 30 second intervals before and after the two-hour period. Operators counted all inbound passengers, keeping a separate tally for children and adults. All those visiting the store after reaching downtown El Paso received a coupon good for a return trip, and these were honored up to 8 p.m. on the day issued. These coupons were punched once for adults and twice for children, and operators turned them in with their trip sheets.

The plan was advertised both by El Paso Electric Company and the Popular Dry Goods Company. In addition to newspaper advertising, the El Paso Electric Company announced the event in dashboard posters and operators told all inbound passengers who rode during the two-hour period that they were guests of the Popular Dry Goods Company. The opening day of the sale was marked by an unusually large turnover, and earnings on the street cars and buses showed a gain over receipts during normal operation.

Chicago Rapid Transit Company Rewards Long Service

Diamond studded pins, emblematic of their long and faithful service to the public, have been awarded to 44 additional employees of the Chicago Rapid Transit Company who have rounded out 35 years of continuous service with the "El" lines. This makes a total of 103 Rapid Transit employees who have been with the company 35 years or more, with an aggregate service record of 3,405 years. Many of these "El" veterans date their entrance into the transportation industry to the time of the World's Fair in 1893.

Other jeweled badges significant of long service have been presented to 55 additional employees who completed 30 years of service; 85 who finished 25 years with the company, and 123 who passed the twenty year mark. This makes a total of 1,194 employees who have been in "El" service twenty years or more.

Vice-President Fallon (extreme right) presenting a 35-year service pin to M. J. Feron, in the presence of (left to right) Otto P. Hintze and Frank L. Baxter, who also received this award

Freight Ouster Contested

The reply of the Cincinnati & Lake Erie Railroad to the suit of the city of Springfield, in which the ouster of the company from the city's streets is sought, was filed at Springfield, Ohio, on June 24, in Common Please Court. The answer challenges the right of the municipality to enact any legislation which would prevent the interurban company from carrying on its interstate and intrastate freight and passenger business, and holds that the action of the city in adopting an ouster resolution was illegal. The developments of June 24 were another step in the controversy between the city and the company over the operation of freight trains through the city. The city has sought to limit such freight train operation to a motor and two trailers, but the company insists that it has the legal right to move as many as six cars.

Test New York City's New Subway Cars

Twenty of the 300 cars purchased by the Board of Transportation, city of New York, have been delivered to South Brooklyn to the tracks of the B.-M.T. system for a test prior to operation on the city's new subway now under negotiation for operation in unified service with the existing rapid transit lines, privately quoted.

The new equipment will be tested on the rails of the B.-M.T. system during the summer under the observation of engineers of the Board of Transportation, the American Car & Foundry Company, which built the cars, by officials of the Westinghouse Electric & Manufacturing Company, which supplied and installed the motors and controls, and also by experts of the B.-M.T. Company.

The City of New York has agreed to pay the B.-M.T. Company 20 cents for each car-mile operated without passengers, and when the cars are to carry passengers as part of the test, the charge will be automatically cancelled for the mileage operated with revenue paying passengers.

The cars were described in detail in ELECTRIC RAILWAY JOURNAL for June, 1931.

Effort Made to Recast Seattle Purchase Terms

Negotiations for an agreement whereby the annual principal payment of the Seattle Municipal Street Railway purchase bonds would be substantially reduced have been resumed by members of the City Council. They are in conference with J. F. McLaughlin, president of the Puget Sound Power & Light Company, who has declared his purpose to co-operate in solving the problem of the railway in a way "fair to our security holders as well as to the general public."

The terms of the contract under which the city took over the local railway lines of the power company calls for annual payments of $833,000 a year. Approximately $8,006,000 remains unpaid of the purchase price of $15,000,000. A two-year moratorium under which the 1929-1930 payments were deferred will expire next March. Virtually no funds have been accumulated to meet the payments due then. It is understood that city officials want bondholders to accept 30-year refunding bonds for the twelve-year bonds originally issued to pay for the street railway property. This would reduce the amount of the remaining installments on the purchase price from $833,000 to $300,000 a year. Pending arrangements for refunding, city officials hope to secure an extension for another year of the two-year moratorium which ends next March.

Central New York Interurbans Sold

Service on the Rochester & Syracuse Electric Railway is scheduled to be discontinued. The line, the last remaining interurban road to enter the city of Rochester, was sold to the Rochester & Syracuse Liquidating Corporation, composed of bondholders, for $115,000 at a foreclosure sale in Syracuse on June 11. Supreme Court Justice Lewis has confirmed the sale. The only step necessary to abandonment is confirmation of the sale, under similar conditions, of the interurban railway connecting Syracuse and Oswego, the Syracuse, Lake Shore & Northern. This road, too, if Justice Smith confirms its sale, will discontinue. The lines connect 3 miles from Syracuse. On June 24 the Oswego Motor Bus Lines was reported ready to supply this service.

When the Rochester and Syracuse line is abandoned, the Eastern Greyhound Bus lines will open service over the same route. The bus company has obtained the necessary franchises from cities and towns along the way, but awaits a grant from the State Public Service Commission. No opposition is expected.

Another unit in the original Beebe electric railway system, the Auburn & Northern Railroad, connecting Auburn and Port Byron, is also scheduled for early sale under mortgage foreclosure proceedings. Richard T. Anderson of Auburn, is referee in that foreclosure, involving bond obligations of $230,000 and defaulted interest.

When these lines cease operations, interurban electric railway service in so far as the Rochester and Syracuse territory is concerned, will have become a matter of history.

General

Baltimore, Md.—So heavy has been the demand for this year's Baltimore street railway and bus directory, issued by the United Railways & Electric Company, that the company has found it necessary to print a second edition. The first edition of 10,000 was completely exhausted.

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St. Louis, Mo.—Two negroes have confessed to the police that they participated in four holdups of street cars on the Kirkwood-Ferguson division of the St. Louis Public Service Company in recent weeks.

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Pittsburgh, Pa.—The Transportation Department of the Pittsburgh Railways is conducting a carhouse accident prevention competition against its own monthly record for 1930. Each month a 14x22-in. bulletin is posted at all carhouses showing the winner for the preceding month. At the close of the year a bronze plaque will be awarded to the carhouse making the best record.

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Seattle, Wash.—Urging that the city light department act at once to take over from the Puget Sound Light & Power Company the balance of the electrical load still carried by the company for the operation of the Municipal Railway, Councilman Nichols, new head of the Council Finance Committee, told his fellow members: "We may as well face this responsibility first as last." Negotiations have been under way for several months, but appraisers for the city and the company have been unable to agree upon a third member to serve as a disinterested party in fixing the price to be paid for substations to be acquired from the power company.

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Baltimore, Md.—The United Railways & Electric Company has sent one of its new cars to Brooklyn, N. Y., for tests under the supervision of the Presidents' Conference Committee of the A.E.R.A.

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Camden, N. J.—Addressing the Camden Chamber of Commerce, Agnew T. Dice, president of the Reading Railroad, said that, in his opinion, the greatest need of South Jersey is co-ordinated transportation. Earnest work is being done in the consideration of unification plans, he said. The Board of Public Utility Commissioners is making an intensive study of the problem by order of the Legislature.

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Toronto, Ont.—Citizens are responding to the invitation of the Toronto Transportation Commission, operating the local city-owned rail and bus lines, to visit the Hillcrest properties, the garage and the Danforth carhouse on June 27, the first day of the T.T.C. Open-House Week.

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Long Beach, Cal.—Dogs used as eyes for blind persons will be permitted on Pacific Electric Railway cars without charge as the result of a ruling by the company approved by the Railroad Commission. The company's former rule barred other than lap dogs from the cars, but at the instance of Charles Brown, blind high school youth of Long Beach, who is led to and from school by a large shepherd dog, the rule has been modified.

Youngstown, Ohio — Harry Engle, former street railway commissioner, admitted in Common Pleas Court here on June 19 that he had threatened John T. Harrington, former president of the Pennsylvania-Ohio Power & Light Company. Mr. Engle contended that officials who were connected with the Pennsylvania-Ohio Company before it merged with the Ohio Edison last year, owed him more than $200,000 on a contract made when Mr. Engle became street railway commissioner eight years ago. Mr. Engle was on the stand for four hours under cross-examination by counsel for County Prosecutor Ray L. Thomas, on trial for blackmail.

BOOK REVIEW

Another Able Contribution to the Literature of Business

"Policy and Ethics in Business," Charles F. Taeusch, managing editor "Harvard Business Review," associate professor of business ethics Graduate School of Business Administration, Harvard University. McGraw-Hill Book Company. 624 pages, $5.

Mr. Taeusch has presented a scholarly discussion of the major problem of business, but wherever the work has deviated from philosophy, it has fallen short of coming to grips with the problems of business. In fact, the author discusses only the principles of business. He makes no attempt to solve them.

Full consideration is given to policies and ethics under conditions that exist. As the author sees it, business facts are not separable from the social texture into which they are woven, and the social texture in turn can be fully appreciated only by an understanding of the physical conditions which support it.

From a study of the relation of business to the church, it becomes apparent that the conduct of business was at first governed by the church and then by the state, a condition from which it is now breaking away. Among the questions which the author propounds is: "Has American business developed a sufficient sense of responsibility to be free to regulate itself?" And to this end he discusses among other things the related subjects of price cutting, reciprocal buying, trade piracy, misrepresentation, advertising, cancelation of contracts, limitation of production and commercial arbitration.

The chapter on advertising deserves more than a passing note. In it, no attempt has been made to develop the science of advertising. Rather has the purpose been to present the ethical problems of advertising in their relationship to the general problems of business ethics. This method of presentation holds true of the other subjects considered, but the subject of advertising appears to be put a little more concretely than some others, if the reviewer's observation is not biased by his own predeliction for the consideration of this particular subject.

On the whole, the book is an important contribution to the growing volume of well-considered literature which is helping to put business into the category of the professions.

Prospects for London Unification Improved

During May the prospects of the London passenger transport bill brightened considerably. This bill, as previously reported, is promoted by the Ministry of Transport on behalf of the Government to establish a public board which is to take over and carry on all passenger transport services in the London traffic area. As also previously reported, the Underground group, including the London General Omnibus Company, agreed early in May to terms whereby their stockholdings would be exchanged for stock issued by the new statutory board. The next development of importance was announced later on in May to the joint committee of both Houses of Parliament which has been examining the bill and hearing witnesses. This was that an agreement has been reached between the promoters (which means the Government) and the four main-line railways of the country as to their London suburban traffic. It was, of course, felt that there could be no complete unification and co-ordination of London passenger traffic unless the suburban business of the trunk railways was included. This agreement provides for pooling the passenger receipts of the new statutory board and of the suburban passenger services of the main-line railways.

According to the statement by counsel for the promoters, the pool will amount to about £37,000,000 a year. The numbers of passengers comprised in this arrangement, taking figures for 1929, were: Underground group railways, 357,000,000; Underground group buses, 1,671,000,000; Underground group tramways, 197,000,000; main line suburban railways, 400,000,000; total agreeing undertakings, 2,625,000,000. The companies which had not yet agreed to the plan at the time this account was written carried the following numbers of passengers for the same year: Non-agreeing companies, 86,000,000; Tillings, Ltd., 152,000,000; independent buses, 91,000,000; total, 329,000,000. In other words, counsel added, 89 per cent of the passengers (apart from the 885,000,000 carried by the municipal tramways proposed to be taken over) were carried by the companies which so far have agreed to the proposal.

On subsequent days of the sitting of the joint committee much was heard of the opposition by the London County Council, which objected to the Council's tramway system being taken over merely by a transfer to the new board of its capital indebtedness without allowance for the money taken from the local rates in past years to meet deficiencies.

At a later sitting of the joint committee, Sir William McLintock, chartered accountant, stated that when instructed to advise the Government on the financial aspect of the scheme, he was asked to proceed on the basis that no Exchequer grant would come into the picture. He estimated the net revenue of the Transport Board at £5,661,991 annually. For a number of years the board would have to pay a certain sum to local transport authorities. The maximum annual payment was £1,000,000. This would be gradually reduced over a period of 59 years. Ninety years was the period taken in the bill for the repayment of the board's capital. Under the proposal that the board should not issue stock to the municipal tramway undertakings but simply assume that system's capital indebtedness, he was prepared to justify the proposition that the local authorities were likely to fare better under the terms of the bill than under a commercial basis. The proceedings were thereafter interrupted for a fortnight by the Whitsuntide recess. The first important announcement following this recess was to the effect that agreement had been reached regarding the London County Council's tramways. This payment bulks £8,500,000 in 4½ per cent stock.

Among general objections taken to provisions in the bill, one merits special attention as coming from so important a body as the Association of British Chambers of Commerce. Sir W. C. Lees, president of the association, has written to the Minister of Transport that since the transport board to be set up would be formed of members appointed by the Minister, the association feels it is unwise to provide that the appointments should be vested solely in a Minister. The opinion of the association is that the influence of party politics will be bound to make itself felt, and that this might ultimately lead to diminution in the efficiency of the undertaking. The letter urges the Minister to amend the bill so as to provide that the appointments are not subject to the influence of any political party.

Higher Speeds for British Trolley Buses

The recently passed road traffic act, which is applicable to the whole of Great Britain, increased the maximum permitted speed of petrol buses from the old limit of 12 m.p.h., to 30 m.p.h., provided that all road wheels are fitted with pneumatic tires. Now the new liberty is being extended to trolley buses. In connection with a 7-mile trolley bus route of the Rotherdam Transport Department, the Minister of Transport has approved a maximum speed of 30 m.p.h., though with lower limits at populous or dangerous spots. This is the first case in England where a 30-mile limit for trolley buses has been allowed. Tramway operators will doubtless call for similar liberty. Hitherto tramcar permitted speeds have varied according to locality and amount of street traffic.

Praise for Underground Posters

I CANNOT entirely agree with the Prince of Wales as to the ineffectiveness of British advertising. For instance, I believe that the maps, posters and newspaper notices of the London Underground Railways have never been excelled anywhere. I have no notion whether they have produced the desired results, but certainly millions of observers have admired them and many (myself included) have even made pilgrimage to the main office of the Underground (decorated, incidentally, with Epstein sculptures) and bought copies. I wish those posters were reproduced in postcard size. I was so pleased by one of their newspaper ads (reproduced with this comment) that I saved it and slipped it in my copy of Keats.—CHRISTOPHER MORLEY *in the "Saturday Review of Literature," New York.*

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Nagoya, Japan—An extensive railway electrification program has been decided upon at Nagoya and Fukuoka. As several hundred miles of railway line are involved the work will be done over a period of years. Power for the electrification may be supplied by utilizing the energy of the Tenryn River.

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Lausanne, Switzerland — For service on streets too steep for electric railway lines the Administration des Tramways has started negotiations for the purchase of two trolley buses from Swiss firms. Another innovation is the operation of passenger trailers on heavy traffic bus lines in Lucerne.

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Jamaica, W. I.—Under an order of Council, recently signed, the government of Jamaica has prohibited operation of buses on main business streets of Kingston, capital of Jamaica, and has given to the Transport Board authority to regulate operation of buses elsewhere. The Transport Board will limit the number of buses that may operate in various sections on the basis of use of transportation service in these sections. In recent years, competition of buses with the cars of the Jamaica Public Service Company has increased to the extent of jeopardizing that company's service.

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Simonstown, South Africa—The 20-mile electric railway from Cape Town to Simonstown may be abandoned. This line was electrified early in 1928. It operated at a loss of £250,000 during the year ended March 30, 1930. One of the principal factors in the losses is ascribed to the cost of electric current supplied by another Government Department, while another important contributing factor has been the extent of the development of bus transportation in Cape Town during the past three years.

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Stockholm, Sweden—A subway project has received a favorable vote in the City Council. The plan involves the construction of underground tracks for the suburban street car lines serving part of the city. In one of the sections where congestion is acute streets are to be built in three elevations.

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Paris, France.—The president of the Municipal Council of Paris, Mr. d'Andigne, favors forbidding all horse-drawn vehicles, street cars and hand carts in all the congested streets of Paris. He has suggested that deliveries effected by horse-drawn vehicles should be made before 10 o'clock in the morning, or during the night. As a concession to "atmosphere," he might allow a few hand carts on the streets at the height of the tourist season, but this spectacle should be so arranged as not to encumber traffic. The Municipal Council has long been considering various methods of alleviating traffic congestion, and some of the drastic reforms advocated by Mr. d'Andigne may be adopted.

PERSONAL MENTION

Greater Responsibility for G. I. Wright

George I. Wright, who, since September, 1927, has been engineer of electric traction of the Reading Railroad, has been made chief electrical engineer of that company with offices at the Reading Terminal, Philadelphia. He will have charge of electrical engineering, signal engineering, electric traction engineering and maintenance other than rolling equipment, power supply and wire crossings and occupations. The Reading has been carrying out extensive electrification projects in the Philadelphia suburban zone under the direction of Mr. Wright, and the new appointment is largely in recognition of the capacity he has shown in supervising the details of the work.

Following his graduation from Leland Stanford University in 1913 as an electrical engineer, Mr. Wright was employed by the Southern Pacific Railroad in connection with the electrification of branch lines. He left that post in 1917 to enter the United States Navy, being appointed electrical officer of the *U. S. S. Montana* after a course of instruction at the Naval Academy. In August, 1918, he was promoted to lieutenant and sent to the Portsmouth Navy Yard to supervise the construction of several submarines.

He resigned from active duty in February, 1919, and for three years was construction superintendent of the Duluth Edison Electric Company, at Duluth, Minn. Following this, he was employed by the Illinois Central Railroad as assistant engineer in charge of electrifying its Chicago terminal. He was with that company for five years, during which time he was promoted to office engineer and handled all features of that work.

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Transportation Staff Realigned for Brooklyn Bus Operation

Under the plan for the functioning of the Brooklyn Bus Corporation as part of the Brooklyn-Manhattan Transit System, referred to elsewhere in this issue, a division of administration will be created under the direction of S. S. Hamilton. Functions of this division will consist of the management of depots; employment, training and discipline of conductors, motormen and operators; and the keeping of all records. F. J. Brennan will be in charge of the operation division, with the title of superintendent of operation, the function of this division including operation of schedules, system dispatching and reporting of all operating conditions. K. M. Hoover will be in charge of the traffic division with the title of superintendent of traffic. The functions of this division will include plans, studies and reports; checks of traffic conditions; and the making of schedules.

As president of the Brooklyn-Manhattan Transit Corporation, the Brooklyn & Queens Transit Corporation and the Brooklyn Bus Corporation, W. S. Menden will control the policies of the three companies, but supervision of transportation for both the bus company and the surface lines will be centered in the new traffic and transportation department. This department will supervise the operation of all buses and street cars of the Brooklyn & Queens Transit Corporation, the buses of the Brooklyn Bus Corporation and the passenger service of the South Brooklyn Railway. William Siebert, new superintendent of transportation, will be in charge of this department with the title of general superintendent of traffic and transportation. The work of the department will be divided functionally into three divisions: administration, operation and traffic.

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Receiver Announces His Staff

The affairs of the Eastern Michigan-Toledo Railroad will be administered in the future from the offices of the Michigan Electric Shares Corporation, Jackson, according to John F. Collins, designated receiver for the railroad.

Mr. Collins has announced the appointment of the following Jackson men as officials of the Eastern Michigan-Toledo line: H. D. Sanderson, manager; O. H. Degener, secretary-treasurer; C. C. Dancer, assistant secretary-treasurer; J. B. King, auditor of freight accounts; A. T. Margwath, auditor of passenger receipts; G. W. Quackenbush, traffic manager; S. S. Major, freight claim agent. R. C. Taylor, Albion, will be superintendent of equipment.

The officials who will manage the Eastern Michigan-Toledo company hold similar positions under the Michigan Electric Shares Corporation.

Passenger and freight service on the line connecting Detroit and Toledo will be continued without change for the present.

Canadian Association Headed by K. B. Thornton

K. B. Thornton

When the present owners of the Montreal Tramways took control in 1925, they cast about for a man with the personality and aggressiveness needed to carry out a plan for major improvements to that property. They found him in Kenneth B. Thornton, who was appointed to the position of assistant general manager. In that office he had charge of the modernization of all departments. The improvements included the revamping of tracks, purchase of new cars, and an almost complete revision of the power supply. He also found it desirable to augment the rail services with numerous bus lines, so that today the Montreal Tramways is one of the largest operators of buses in Canada. The success that has attended his efforts is manifest by his contribution to the work of maintaining the physical condition of the property and his preserving through the years the excellent employee and public relations so long outstanding accomplishments at Montreal. In 1930, Mr. Thornton was promoted to the position of general manager, Col. J. E. Hutcheson becoming managing director.

Prior to his appointment as assistant general manager of the Tramways, Mr. Thornton was chief engineer, general manager and director of the Canadian Light & Power Company and the Quebec New England Hydro-Electric Corporation, with headquarters in Montreal. In 1915 he also became consulting engineer for the Montreal Tramways, principally in connection with the power supply. This appointment gave him a great deal of familiarity with the property and was of material aid to him when he assumed his managerial duties. From 1904 to 1911 he was electrical engineer in the operating department of J. G. White & Company, of New York. His first position after completing his education in 1893 was that of engineer of the operating department of the Montreal Light, Heat & Power Company.

Mr. Thornton has spent the greater part of his life in Montreal, where he was born on June 26, 1873. Seeking a broadened viewpoint, he attended the Central Technical College in England, being graduated from that institution in 1893. Despite his intensive professional work, he has found time to engage in many activities. He is a member of the Corporation of Professional Engineers of the Province of Quebec, a member of the Engineering Institute of Canada, and a member of the American Institute of Electrical Engineers. He is a past vice-president of the Engineering Institute of Canada. He has been connected with the Canadian Electric Railway Association for a number of years, having served on the board of directors. His election at the recent meeting of the association in Ottawa to the office of president, the highest honor that can be conferred on an electric railway operator in Canada, is a fitting tribute to the esteem in which he is held by the men of the industry.

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Kansas City Lawyer on Missouri Commission

The Missouri Senate has approved the appointment of George H. English, a Kansas City attorney, as a member of the Missouri Public Service Commission. He was named to the commission by Governor Henry S. Caulfield some time ago.

Frank Pick Heads British Institute of Transport

Frank Pick, managing director of the London Electric Railway, the Metropolitan District Railway, the City & South London Railway, the Central London Railway, and other companies associated in the London Underground combine, has accepted the presidency of the British Institute of Transport for the 1931-32 session.

Mr. Pick has had a brilliant career. Born at Spalding in 1878, he was educated at York, and was subsequently articled to an attorney in that town. In 1902 he qualified as an attorney, and in 1903 became LL.B. (London University) with first-class honors. In 1902 he entered the service of the Northeastern Railway, under Sir George Gibb, then general manager, and worked successively in the statistics office, district superintendents' offices at Sunderland and Newcastle-on-Tyne, the rates office, and finally the general manager's office.

Mr. Pick went to London in 1906, at the instigation of Sir George Gibb when Sir George took over the management of the Metropolitan District and the London Electric Railways. Upon Sir George's retirement in 1907, Mr. Pick was transferred to the staff of A. H. Stanley, now Lord Ashfield, then president of the Board of Trade, to take charge of the Household Fuel and Lighting Department of the State Coal Mines Department. In 1921 he was appointed joint assistant managing director of the companies comprised in the London Underground Combine, while in 1924 he assumed full administrative control under Lord Ashfield, chairman of the board.

Mr. Pick's appointment as sole managing director dates from March, 1928. He is a foundation member of the Institute of Transport, a member of the London and Home Counties Traffic Advisory Committee, a member of the Empire Marketing Board, member of the Council of the London & Provincial Omnibus Owners' Association and the Commercial Motor Users' Association, and a member of the Standing Joint Committee on Mechanical Transport. He is also president of the Railway Students' Association.

Editorial Recognition for President Menden

Credit long deferred is accorded to W. S. Menden, chief operating officer of the vast Brooklyn-Manhattan Transit System, in an editorial in the New York *Evening Sun* recently. Under the title "Mr. Menden Scores," the *Sun* said:

> In discussing prices to be paid for the rapid transit lines if they should be unified under his plan, Mr. Untermyer has made the point that the loss in passenger revenue means that the properties are worth less. Nobody can successfully attack the economic soundness of this opinion.
>
> In eight months of its fiscal year, the B.-M.T. receipts from passengers fell $600,000 below the receipts for eight months in the prior fiscal year. But the B.-M.T. cut operating expenses slightly and lowered actual maintenance expenses $550,000 below the expenditures of the prior year. By this means the net loss was reduced to $61,000. Management cut down expenses 12 per cent. On a net basis, therefore, the value of the B.-M. T. properties would be approximately the same as for the prior year. The Interborough's actual maintenance for the same period increased $560,000.
>
> The operating president of the B.-M. T. is William S. Menden. Mr. Untermyer has paid many compliments to Mr. Menden, whose latest accomplishment must draw the admiration of the directors and stockholders of the company.

Commissioner Out Under Pinchot in Pennsylvania

James S. Benn, who has been under the fire of Governor Pinchot of Pennsylvania since the primary of last May, has resigned from the Public Service Commission of the Commonwealth. Mr. Benn said:

> During the last year or eighteen months the present executive has made regulatory law in Pennsylvania the football of politics. To keep kicking this football in the air for another year or more to come, it is the declared intention of the executive to call a special session of the Legislature in 1932.
>
> This makes it quite evident that the administration of the Public Service Company Law in Pennsylvania is for a further indefinite period to be subjected to misrepresentation and the exigencies of politics. Under these circumstances, and particularly in view of the personal antipathies which characterize the Governor's campaign, I feel that it would be unjust to the commission and to the Senate to permit my nomination to remain as a factor in the situation.

Mr. Benn has been a member of the commission for more than eleven years, having been first appointed by Governor Sproul. In 1925 an attempt was made by Governor Pinchot to remove Commissioner Benn and Commissioner Ray Shelby, but the effort was rendered abortive by a decision of the Supreme Court of the State, which held that the power of appointment and removal was in the hands of the Legislature. The Governor, it was held, was merely the nominating agency. Mr. Pinchot renewed his attacks upon the commissioner immediately upon announcing his candidacy for Governor last spring.

C. B. Short Goes to Portland

C. B. Short has resigned as manager of the Roanoke Railway & Electric Company and the Safety Motor Transit Corporation, Roanoke, Va., to become manager of the Pacific Northwest Public Service Company, Portland, Ore. He will be succeeded at Roanoke by W. H. Horne, former superintendent of transportation.

Mr. Short will leave for Portland in the near future to assume his new duties. The Portland company operates 600 street cars over 300 miles of track and has 1,600 employees. Both it and the Roanoke Railway & Electric Company are subsidiaries of the Central Public Service Company, the former including the largest electric railway system controlled by the Central Public Service Company.

Since June, 1928, Mr. Short has served as manager of the Safety Motor Transit Company, Central Public Service Company acquiring the bus company at this time. He succeeded J. W. Hancock as manager of the railways at Roanoke. He is a native of Vinton.

Mr. Horne has been in the employ of the Roanoke Railway & Electric Company since 1898.

Joseph T. Sullivan, for nearly two years manager of the gas department of the Virginia Electric & Power Company at Norfolk, has been transferred to Richmond as general manager of the electrical department. Mr. Sullivan succeeds Roy S. Nelson, recently resigned to become connected with the Baton Rouge Electric Company. Mr. Sullivan went with the Norfolk division of the Virginia Electric & Power Company in September, 1929. Prior to that he was manager of the Stone & Webster property operating in Reno, Nev.

◆

Earl E. Grover, director of safety for the Columbus Railway, Power & Light Company, Columbus, Ohio, has been named president of the newly formed Safety Council organized by the Chamber of Commerce at Columbus. The council will seek to check the increasing number of accidents in the home and on the streets by combating the apparent indifference of people to the tragedies of accident.

◆

C. S. Clevenstine, traffic manager of the Clinton, Davenport & Muscatine Railway, Davenport, Iowa, has been named general superintendent. He succeeds the late C. F. Dege. Mr. Clevenstine started with the Tri-City Railway, Davenport, in 1905 as a conductor. In 1912 he was transferred to the interurban. In 1917 he became train dispatcher of the combined C. D. & M. Railway, a rate clerk in 1923, and traffic manager in 1928, the post he has held until the present promotion.

◆

Harry K. Cuthbertson, Peru, a state senator, has been appointed a member of the Public Service Commission of Indiana by Governor Leslie. At the same time, the Governor announced the reappointment of Commissioner Howell Ellis, of Indianapolis. Senator Cuthbertson will succeed to a democratic post on the commission now held by Commissioner Calvin McIntosh, whose four-year term expires May 1. John W. McArdle and Fred C. King have been reappointed chairman and secretary, respectively, of the commission.

◆

Charles C. Buckland has resigned as general manager of the Berkshire Street Railway, Pittsfield, Mass., and will remove to Minneapolis. Mr. Buckland is a son of E. G. Buckland, chairman of the board of the New York, New Haven & Hartford Railroad. He was graduated from Yale University in 1922 and became connected with the company at Pittsfield last December.

◆

T. W. Noonan, general manager of the Pittsburgh Motor Coach Company, affiliated with the Pittsburgh Railways, was elected president of the Pennsylvania Bus Association at the annual convention of the association in Juniata on June 5. Nearly 200 delegates, representing more than 100 motor coach companies operating in the state, were represented at the gathering. Mr. Noonan has been general manager of the Pittsburgh Motor Coach Company since its organization on Aug. 14, 1925.

◆

Frederick M. Feiker, formerly a member of the staff of the McGraw-Hill Publishing Company, has been designated by President Hoover as director of the Bureau of Foreign and Domestic Commerce, one of the largest and most important of the government's bureaus.

Work of C. J. Roggi Recognized

Charles J. Roggi, who joined the staff of Electric Railway Journal in July, 1930, has had his duties widened as assistant editor to cover a range of activities more nearly in consonance with the breadth of his previous training, covering as it did not only engineering, but public utility management in its wider phases and traffic management, and reflecting the capacity shown by him in his editorial work during the past year.

Mr. Roggi was graduated from Massachusetts Institute of Technology. He directed his entire collegiate training toward the field of transportation. His work at M.I.T. began in 1925 with his enrollment in the five-year co-operative course in electrical engineering during which he obtained about 68 weeks of co-operative practice with the Boston Elevated Railway. This practice was in the nature of a student apprentice course in which he spent some time in nearly every department of the company.

C. J. Roggi

Not content with that, he attended the Harvard School of Business Administration during his last year at "Tech." There, as a special student, he took courses in traffic management and public utility management. He was graduated from M.I.T. last year with B.S. and M.S. degrees. Mr. Roggi was born in Brooklyn, N. Y., in 1907.

◆

Duties with Westinghouse Company Increased

J. S. Tritle has been elected vice-president and general manager of the Westinghouse Electric & Manufacturing Company in charge of manufacturing, sales and engineering operations of the company, reporting to President F. A. Merrick.

Mr. Tritle was born in Virginia City, Nev., in 1872. He received his early schooling in New Haven, Conn., and was graduated from Yale University in 1893 with a degree in science. In 1895 he entered the electrical engineering contracting business, but at the outset of the World's Fair in St. Louis he accepted a position as chief of construction. At the close of the fair he became manager of the Kansas City district for the Westinghouse Company. In 1915 the St. Louis and Kansas City offices were consolidated, Mr. Tritle assuming charge of both. In 1922 he was made manager of the merchandising division of the general sales department of the company. In 1925, when a separate department was made of the merchandising business, Mr. Tritle was made general manager of the merchandising department overseeing engineering and manufacturing, as well as sales work, with headquarters in Mansfield, Ohio, where most of the merchandising products are made. From Mansfield he was moved to East Pittsburgh on May 1, 1929, as vice-president in charge of manufacturing operations. In his new position as vice-president and general manager, Mr. Tritle will retain his headquarters in the Westinghouse Company's main works at East Pittsburgh, Pa.

◆

G. R. Fulton With Gulf States Company

George R. Fulton, formerly of Richmond, Va., has been appointed superintendent of production of Gulf States Utilities Company, Beaumont, Tex., succeeding H. R. Sharpless who recently joined the Gulf Refining Company in a similar capacity at Port Arthur.

Mr. Fulton joined the Stone & Webster organization in 1916 as a station student engineer with the Savannah Electric Company at Savannah, Ga. From that company he went to the Baton Rouge Electric Company and thence to the Galveston-Houston Electric Company. From the latter company he entered the power division of the Stone & Webster Engineering Corporation, and more recently has been assistant manager of production and transmission of the Virginia Electric & Power Company.

◆

M. C. Cleveland New York Commission Engineer

Malcolm C. Cleveland, New York City, assistant chief engineer of the Lehigh Valley Railroad and engaged in engineering work for more than 30 years, has been named chief engineer of the New York Public Service Commission, to occupy the position made vacant by the resignation of Charles R. Vannemann, who retired to become head of the firm of Charles R. Vanneman, Inc., for the practice of consulting engineering.

Mr. Cleveland goes to the commission with a wide experience in the various fields of engineering work. After he was graduated from the Case School of Applied Science he entered railway service with the Baltimore & Ohio Railroad. From 1902 to 1904 he was assistant engineer maintenance of way for the Cleveland, Cincinnati, Chicago & St. Louis Railroad, and from 1904 to 1907 he was engineer maintenance of way for that road. From 1907 to 1910 he was division engineer of the Michigan Central Railroad.

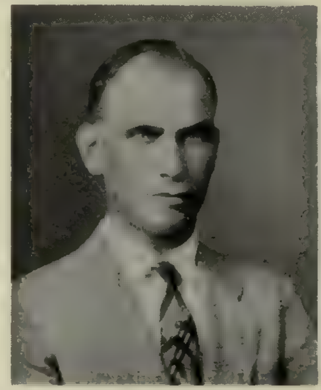
Mr. Cleveland became special engineer on the staff of the vice-president of the New York Central Railroad in 1910. He later was made engineer maintenance of way of the Chicago, Indiana & Southern Railroad, now merged with the New York Central.

For more than a dozen years Mr. Cleveland was valuation engineer of the Lehigh Valley Railroad; during which time he was in entire charge of all the work in connection with the valuation made by the Federal Government. He became principal assistant engineer of the Lehigh Valley in 1927 and two years later was elevated to the position of assistant chief engineer of that road.

◆

J. T. Porter Heads Southern Equipment Association

J. T. Porter, superintendent of equipment of the Virginia Electric & Power Company, Richmond, Va., elected president of the Electric Railway Association of Equipment Men, Middle Atlantic States, at its meeting held in Washington, D. C., May 14 and 15, is a native Texan. He entered the street railway business in 1902 as an armature winder with the Houston Electric Company, Houston, Tex. Since that time he has held such positions as master mechanic, general foreman and general superintendent on the properties in Texas, Louisiana and Oklahoma. He went with the Virginia Electric & Power Company, as superintendent of equipment in March, 1926, which position he holds at the present time. He has had the distinction of serving two properties under the management of Stone & Webster, namely, the Northern Texas Traction Company and the Virginia Electric & Power Company, at the time they won the Coffin Award.



J. T. Porter

◆

"Here Come the Elephants" Receives Recognition

John R. Marsh, manager of the public relations department of the Georgia Power Company, Atlanta, Ga., was elected a member of the board of directors of the Public Utilities Advertising Association, in convention at New York on June 17.

The department, of which Mr. Marsh is head, also was honored by the award of two prizes in recognition of outstanding advertising done during 1930. The Georgia company was presented with second prize in the Better Copy contest, electric railway division, for its advertisement captioned "Here Come the Elephants," which was published in Atlanta newspapers last June. The company also was awarded second nation prize in the car cards and posters division for a poster which appeared on the dashboards of the street cars last year—decorated with a long vista of "No Parking" signs and captioned "Shop by Street Car."

Harrison Hoblitzelle, vice-president and general manager of the General Castings Corporation at its Granite City, Ill., plant, has been transferred to Philadelphia to become executive vice-president of the company. He has been in charge of both plants for some time. Mr. Hoblitzelle was vice-president of the Commonwealth Steel Company when that company was absorbed by the General Castings Corporation.

Michael J. Feron, assistant to the vice-president in charge of operation of the North Shore Line and the Chicago Rapid Transit Company, recently rounded out 36 years of continuous service with the latter organization. In recognition of this long-time record, he has been awarded a diamond-studded pin instituted as a merit badge for employees who have served 35 years or more with the "El" lines.

OBITUARY

H. E. Chubbuck

H. E. Chubbuck, long executive vice-president and general manager of the Illinois Traction System, Peoria, Ill., and following that an officer and a director of the Illinois Power & Light Corporation, the successor company, died in that city on June 4. For many years Mr. Chubbuck was one of the most influential men in the electric railway field in the Middle West. He was the close associate of the late Senator William B. McKinley in the management of the Illinois Traction System and other properties, familiarly known as the McKinley system, combining trackage of more than 700 miles and serving the principal cities of central Illinois. With the Senator, he shared the prestige which these properties gained, a prestige nationwide because of successful operating accomplishments, financial stability and engineering achievements, including the famous bridge over the Mississippi River at St. Louis.

The McKinley system was a vast enterprise. During Mr. Chubbuck's incumbency as executive vice-president, it included two main line railroads, completely electrified, and many light, gas, heat and railway system in Illinois and several in Kansas and Iowa. The task of co-ordinating through him all the activities of this vast system was colossal, but Mr. Chubbuck achieved it with the greatest celerity. He was very widely known in the communities in which the various companies operated, and, despite the exactions of his official positions, found time to be a factor in civic affairs, particularly in Peoria. Following his withdrawal from active participation in the affairs of the Illinois Power & Light Corporation, he served in a number of business enterprises, notably as a director of the Merchants & Illinois National Bank at Peoria.

Mr. Chubbuck came of a family of electrical geniuses. His grandfather, S. W. Chubbuck, was a pioneer in the then undeveloped field of electricity. He collaborated with Morse in the invention of the telegraph. He lectured over the country on electricity, and was an inventor of note. Mr. Chubbuck's father, A. S. Chubbuck, was also an inventor. He perfected the telegraph sounder and established, at Utica, N. Y., the first factor for the manufacture of telegraph instruments in the world. He was also the inventor of the jack-knife bridge.

As this brief recital shows, H. E. Chubbuck was raised in this atmosphere of electricity, and at the age of eleven was actively at work in his father's factory. He associated himself with the Thomson-Houston Company, pioneers in the electric-lighting field, where he was on the staff of experts. He then went with the General Electric Company. Among other properties that stand as milestones of his advancement is the railway system of Pueblo, Col. During the dark days of the panic of 1893, Mr. Chubbuck was appointed receiver of this company by the United States Court. He took charge when the property was run down, in debt and demoralized. He rehabilitated it physically and financially.

In his association with Mr. McKinley, Mr. Chubbuck first took charge of the Quincy, Ill., railway lines, and brought these to a high standard of perfection. He was then put in charge of the Chicago, Ottawa & Peoria Railway which ran through Princeton, Marseilles, Ladd, Peru, Spring Valley, Streator, Ottawa, Morris and Seneca. Here again Mr. Chubbuck distinguished himself, so much that Mr. McKinley placed him in absolute charge of all the properties.

Stephen G. Shaw, claim agent for the Denver Tramway, Denver, Col., for the last eighteen years, died on June 18 after an illness of three weeks. He was born at Rockport, Ill., 66 years ago.

◆

Conrad C. Steinbrenner, one-time vice-president of the Galena Signal Oil Company, died recently at Long Beach, Cal. Mr. Steinbrenner was identified with the Galena company from 1893, when he entered the railway auditing department, until 1918. The remains were interred at Franklin, Pa., on June 4 under Knight Templar rights.

◆

Harrington Emerson, efficiency expert who was president of the Emerson Engineers from 1900 to 1923, died on May 23 in his 77th year. A native of Trenton, N. J., Mr. Emerson was educated at the Royal Bavarian Polytechnic. After six years as professor of modern languages in the University of Nebraska, he spent fourteen years as a banker and realty operator. As the American representative of a British syndicate, he examined many industrial plants and mines in this country, Mexico and Canada. His efficiency methods first became widely known through the results achieved on the Santa Fe Railroad.

◆

Emmet Tinley, on the legal staff of the Omaha & Council Bluffs Street Railway, Omaha, Neb., since 1902, when the Omaha company leased the Council Bluffs property and the bridge, died on May 12. He was made a member of the board of directors in 1927 and was a member of the board when he died. Mr. Tinley was regarded as one of the outstanding lawyers of the country. Of him *Teamwork*, official publication of the company, said: "The statement has been made repeatedly, and agreed to by every person connected with the company from the president down, that Mr. Tinley probably knew more about the Omaha & Council Bluffs Street Railway than any other man. Mr. Tinley's passing from the company creates one of the rare instances where a man can be succeeded but not replaced."

◆

John W. Walsh, an attorney for 25 years associated in the law department of the Chicago Surface Lines, died on May 28 after an illness of several months. He was a specialist in damage suits.

◆

Frederick William Warren, former manager of street railways, died on May 28 at his home in Kingston, N. Y., in his 76th year. After serving the West Shore Railroad at Kingston, he managed electric railways in Canada and Birmingham, England. Later he was with the Dominion Coal & Steel Corporation at Sydney, N. S.

◆

Irwin Fullerton, general auditor for the Detroit United Railway, Detroit, Mich., for 27 years until his retirement in 1922, died recently at his home in Pleasant Ridge, Mich. He was 74 years old. Mr. Fullerton's connection with the Detroit United Railway began in 1895 when he moved from Cleveland to Detroit. He withdrew from the service of the company following the purchase of the local city lines of the company by the city for municipal operation.

◆

William A. Smith, associated with the Omaha & Council Bluffs Street Railway, Omaha, Neb., for more than 50 years, and president of the company for some time, died on June 19 in his home in Council Bluffs. When he went to Omaha 59 years ago he drove a horse car. He was 84 years old.

◆

Michael F. Ryan, at one time superintendent of surface lines of the Philadelphia Rapid Transit Company, but for a number of years attached to the office of special agent, died on May 25. He was 78 years old. Mr. Ryan entered railway service in Philadelphia on July 23, 1872, as a conductor. He became division superintendent at Sixteenth and Jackson Streets on Nov. 11, 1896, and he was made superintendent of surface lines on Nov. 16, 1908.

◆

Richard J. Cullinan, assistant counsel to the New York Board of Transportation, died recently. He was 42 years old. Mr. Cullinan was born in Brooklyn and was educated at the Cathedral School in Manhattan, Fordham High School and Manhattan College, graduating from the college as a Bachelor of Science. He subsequently studied law at Fordham University Law School, graduating in 1920 and being admitted to the bar in the same year. In 1914 he joined the Public Service Commission, First District, and two years later was transferred to the Transit Construction Commission. He then served as a structural draftsman in the Board of Transportation until 1927, when he was appointed to the legal staff.

INDUSTRY MARKET AND TRADE NEWS

Electric locomotive to handle high-speed passenger trains of the New Haven

New Haven Locomotives on Test

The first of ten electric passenger locomotives under construction for the New York, New Haven & Hartford Railroad at the Erie works of the General Electric Company has been delivered after undergoing a series of rigid tests. Deliveries of the remaining units are to be made this summer.

The new locomotives will take over a number of the high-speed passenger runs between New Haven and New York City. The weight and capacity of the units, exceeding those of the present equipment by a wide margin, will permit the handling of heavier trains at high maximum speeds with a single locomotive unit.

Provision has been made for operation on the 600-volt direct-current supply of the New York Central, as well as on the 11,000-volt single-phase main lines of the New Haven and the Pennsylvania.

Designed for a maximum speed of 70 m.p.h., the locomotives have a continuous rating of 2,740 hp., and a one-hour rating of 3,440 hp. The running gear is of the 2-C+C-2 type, similar to the Cleveland Union Terminal locomotives. Each of the six driving units is a twin motor carrying two armatures, with the two pinions meshing in a single gear mounted on a quill. The quill spider on each axle contains six spring cup elements engaging with the wheel at each end.

The motor consists of two twelve-pole stators in a single frame, with multiple-wound armatures. Control equipment is provided for handling the motors in either the a.c. or d.c. zone. The line breaker is of the high-speed air-break type, operative on both a.c. and d.c. service. This is the first application of this device to a.c. locomotives. Provision is made for multiple operation of the locomotives, and for control from either end.

◆

$4,700,000 for Construction of Electric Locomotives

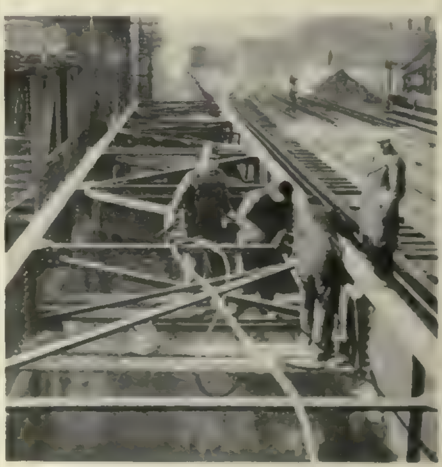
Pennsylvania Railroad has placed orders for the construction of the mechanical parts or chassis of 90 of the 150 electric locomotives for which the railroad recently ordered $16,000,000 of electrical equipment. Construction and material orders for the 90 chassis will cost $4,700,000.

Of the locomotives included in the orders, 54 will be built by Westinghouse, 25 will be constructed by General Electric, and eleven will be built in the Pennsylvania Railroad shops at Altoona. The locomotives to be built at the Altoona works of the Pennsylvania Railroad will carry electrical equipment built by the General Electric. Contracts for the installation of the electrical equipment and control will be awarded later.

Deliveries on this order are scheduled to begin not later than December, 1931, and the entire consignment of 90 locomotives is to be ready June, 1932.

Each locomotive will have a one-piece cast-steel main frame or bed. The beds for these and the remaining locomotives in the total present program of 230 units or engines, will be built by the General Steel Castings Corporation. Locomotive parts included in the order consist of driving wheels, axles, trucks, frame and cab and structural parts in which the electrical apparatus will be installed later. The construction and material costs are in addition to the cost of the electrical equipment recently ordered.

The passenger locomotives for which construction orders were placed, are known as Class P-5. This type is a heavy-duty, high-speed passenger locomotive, 62 ft. 8 in. in length, and weighing 375,000 lb. This locomotive has three pairs of 72-in. driving wheels and a four-wheel engine truck at each end. It is composed of three distinct units, the chassis unit, a deck unit and a cab unit.



New station under construction for Chicago's rapid transit system

Baltimore Orders 50 Buses for Replacement Program

The United Railways & Electric Company, of Baltimore, has recently placed an order for 50 buses at an approximate cost of $450,000. These new buses will be used entirely to replace buses now in service that are rapidly becoming obsolete. This move is in line with the company's policy of modernizing all of its equipment as soon as its financial position permits.

The order was distributed among three companies as follows: 30 to Mack, ten to Yellow Coach, and ten to American Car & Foundry. All the buses will be of the single-deck type, with seating capacities ranging from 31 to 33.

Of the 30 buses to be built by Mack, twelve will be equipped with rear-exit treadle-operated doors, and four with gas-electric drives. The rear-exit buses will have a seating capacity of 31, the remaining eighteen a capacity of 33. Specifications of the Mack buses include dual ignition, Barlow fuel pump with vacuum tank as reserve, special air intake permitting air to be taken from the exterior in the summer and from under the hood in the winter, and inverted dual reduction axles. The gas-electrics will be equipped with General Electric single-motor drive.

All the buses will be special jobs because of the restriction of the State of Maryland to a maximum width of 93 in.

◆

Indiana Railroad Building New Substations for its High-Speed Interurban Service

A new rotary converter substation with a capacity of 500-kw. was resently placed in service near Montpelier by the Indiana Railroad. The station is the first of five being built by the Indiana Railroad to increase the power supply on the line from Indianapolis to Fort Wayne for operation of the new high-speed interurban cars to be inaugurated next month. The other four substations, located near Fortville, Pendleton, Eaton and at a point 5 miles south of Montpelier, will be completed within the next three weeks. The station at Eaton and the one south of Montpelier will be equipped with 500-kw. rotary converters: those at Pendleton and Fortville will have mercury arc rectifiers, having a capacity of 850 kw. each.

◆

Track Elevation Work Speeded

The work of elevating the tracks on Evanston division of the Chicago Rapid Transit Lines between Church and Isabella Streets, a distance of 1¼ miles, is moving forward rapidly. Plans have been made for three new stations to be erected in connection with the track elevation. The first of these will be at Central Street which, in addition to serving a thickly-populated suburban district, is the main transportation point for thousands attending football games at Northwestern University in Evanston. Special features for handling the football crowds with the maximum of speed and convenience will be installed at this station.

Equipment Pageant Will Picture Future of Mass Transportation

As a contribution in commemoration of the Golden Jubilee of the American Electric Railway Association, equipment manufacturers will offer a pageant of modern cars and buses at the convention at Atlantic City. The pageant will be arranged for the plaza space in front of the auditorium. Plans were agreed upon at a subcommittee meeting of the Manufacturers' Advisory Committee, appointed to co-operate with the exhibit and entertainment committees of the association.

The pageant will include ten units incorporating all the latest improvements and design features. The units to be included in the pageant, and the manufacturers tentatively appointed to display each unit are shown below:

1.	High-speed car	56 ft.	Brill
2.	Large city street car	50 ft.	St. Louis
3.	Medium city street car	45 ft.	Cincinnati
4.	40-passenger trolley bus	33 ft.	Twin Coach
5.	30-passenger trolley bus	26 ft.	Brill
6.	42-passenger gas bus	33 ft.	Mack
7.	38-passenger gas bus	33 ft.	White
8.	33-passenger gas bus	31 ft.	General Motors
9.	21-passenger gas bus	25 ft.	Fargo
10.	Taxicab	16 ft.	General Motors

All units will be painted in a uniform color scheme with light green panels, cream superstructure and aluminum painted roof. The standard A.E.R.A. monogram of dark blue and gold will appear on one side.

◆

Chicago Looking Ahead Toward Suburban Electrification

Eventually, electric rapid transit trains will operate over the rights-of-way of steam railroads in the Chicago area, Britton I. Budd, president of the Chicago Rapid Transit Company, predicts.

Edward J. Noonan, engineer for the City Council's railway terminal committee, has estimated the cost of adapting steam railroad lines for electrical service at about $10,000,000. There are 100 miles of line and 200 miles of track within 5 to 10 miles of the Chicago Loop. Railroad engineers estimate it would require $500,000,000 for complete electrification of Chicago terminals and suburban service.

◆

New Type Escalators for Boston Elevated

Installation of a new single file escalator at Forest Hills and the installation of another new escalator at a later date after the removal of the existing escalator is asked by the Boston Elevated Railway in plans filed with the State Department of Public Utilities. The cost of the first escalator is estimated at $47,600 and of the second at $47,100. This includes the cost of removing the present escalator. Installation of the first escalator will take three months from the time it is ordered.

The proposed escalator is the newest "clean-step" type embodying the good features of the old cleat and step escalators. There is only one escalator like it in Boston, although similar escalators are used in department stores in New York and in foreign countries. The cleats form distinct steps, 12 in. wide and 7½ in. high. The cleat steps rise gradually at the bottom and flatten out at the top. Another advantage of the proposed escalator is that the passenger when reaching the head of the escalator steps off in front instead of sideways as at the present Forest Hills escalator.

The proposed escalator would have a rise of 28 ft., 7 in. at a 30 deg. angle. It is 2 ft. wide, capable of accommodating 4,000 person an hour and travels at a rate of 90 ft. a minute. The first escalator will be built southerly of the present escalator and will operate from South to North; the second escalator will operate North to South. Both will discharge passengers near the center of the platform and will result in better distribution of passengers.

◆

AC Spark Plug Company announces the appointment of Charles Wesley McKinly as chief development engineer to succeed Joseph Zubaty. Mr. Zubaty is leaving after eight years of service for an extended stay in Prague.

Buda Company, Harvey, Ill., manufacturers of railroad supplies, Diesel engines and power units for various portable and stationary requirements, are celebrating their 50th anniversary.

Brill Closes St. Louis Plant

The J. G. Brill Company has announced the closing on July 1 of its plant in St. Louis, formerly known as the American Car Company. In closing this plant, the Brill Management is following the trend toward the elimination of uneconomical operation by concentrating its manufacturing activities for electric railways in the West and Middle West at the plant of the J. G. Brill Company of Ohio in Cleveland.

With the growing interest in trolley buses and the larger emphasis being placed today on the importance of public appeal in both trolley buses and electric cars, it was also felt that the facilities at the Cleveland plant were more adequately suited to and possessing even a larger capacity than required to meet the needs of electric railways in the middle and western territories. Therefore, in concentrating its activities for these territories in one plant the Brill Company feels itself in even better position to take care of the requirements of those electric railways interested in new equipment and to provide the service necessary to satisfactory operation.

The J. G. Brill Company's Western region will continue sales representation in St. Louis, with R. S. Hood at 1558 South Vandeventer Avenue.

Gas-Electric Wrecking Crane for Cleveland Union Terminal

Double-end wrecking crane, the first wrecking crane with gas-electric drive, has recently been purchased by the Cleveland Union Terminal Company, from the Industrial Brownhoist Corporation, Cleveland. Designed specially for work in tunnels with close clearances, it has a capacity of 105 tons at each end. Three independent sources of power are available, consisting of two 225-hp. gasoline engines connected directly to 350-amp., 400-volt d.c. generators, and one 208-cell storage battery.

Simplified Packaging of Overhead Material Adopted

A simplified practice recommendation covering the packaging of twenty items of overhead electric railway materials was adopted at a general conference of representatives of all interests, held under the auspices of the division of simplified practice of the Bureau of Standards, Department of Commerce, at Pittsburgh.

Recommendations were made for the packaging of the following materials: protecting trolley armor, pole bands up to and including 6 in., pole bands 7 in. and more, fork bolts with insulator ½ in. in diameter, fork bolts with insulator ⅝ in. in diameter, angle crossarm braces, flat steel crossarm braces, crossings or crossovers, trolley wire clinch ears, trolley frogs, straight line hangers, cap and cone insulators, section insulators, Globe & Giant strain insulators, wood strain insulators, feeder pins for steel crossarms, straight line suspension pullovers, soldered trolley wire splicing sleeves, mechanical trolley wire splicing sleeves and line section switches.

ADVERTISING LITERATURE

Carbon Brushes and the principles governing their characteristics and performance are discussed in a 42-page booklet offered by the Boxill-Bruel Carbon Company, Columbia Park, Ohio.

Potentiometer Pyrometers are featured in its new catalog No. 1101 by the Brown Instrument Company, Philadelphia. A short introduction outlines the nature and application of the potentiometer principle to pyrometry.

Mercury-arc Rectifiers with steel tanks is the subject of the Westinghouse publication C-1907-A. Principles of operation, design characteristics and auxiliaries are the topics covered.

Kips Bay Station of the New York Steam Corporation is described in a booklet issued by the Combustion Engineering Corporation, 200 Madison Ave., New York. Detailed description is given of the fifth steam generating unit, recently placed in service.

Bus Deliveries

Boston Elevated Railway, Boston, Mass., four Twin Coach, Model 40.

Boston, Worcester & New York Street Railway, Framingham, Mass., five white, Model 65A.

British Columbia Electric Railway, Vancouver, B. C., one White, Model 613.

Chicago Surface Lines, Chicago, Ill., ten Twin Coach trolley buses.

Columbia Railway, Gas & Electric, Columbia, S. C., seven Twin Coach, Model 20.

Columbus & Zanesville Transportation Company, Zanesville, Ohio, three Yellow Coach, 29-passenger parlor type.

Eastern Massachusetts Street Railway, Boston, Mass., nine A.C.F., metropolitan type; three Twin Coach, two Model 30 and one Model 40.

Capital Traction Company, Washington, D. C., one A.C.F., 37-passenger parlor type.

Nashua Street Railway, Nashua, N. H., two Mack, 29-passenger city type.

Northampton Street Railway, Northampton, Mass., one Mack, 25-passenger city type.

Pacific Electric Company, Los Angeles, Cal., twelve Twin Coach, Model 30.

Public Service Company of Colorado, Boulder, Col., four Mack, 20-passenger city type.

San Antonio Public Service, San Antonio, Tex., six Yellow Coach, 21-passenger city type.

Sault Ste. Marie Traction Company, Sault Ste. Marie, Mich., one Yellow Coach, 21-passenger city type.

Scranton Bus Company, Scranton, Pa., five White, Model 54.

Three Rivers Traction Company, Three Rivers, Que., four White, Model 613.

United Service Company, Tulsa, Okla., two White, Model 613.

Virginia Electric & Power Company, Richmond, Va., five Twin Coach, Model 30.

◆

Receiver Named for Hale & Kilburn

A federal court receiver has been appointed for Hale & Kilburn Company, manufacturers of automobile, street car and bus equipment, in a mortgage foreclosure suit filed by the Fidelity-Philadelphia Trust Company, trustee for the bondholders. The bill of particulars states that the company defaulted in the payment of installment interest of $26,820 on outstanding mortgage bonds of $894,000. No figures were given as to the general liabilities and assets. The mortgage was created in 1919 when the company was known as the Hale & Kilburn Corporation.

Conspectus of Indexes for June, 1931

Compiled for Publication in **Electric Railway Journal** by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	June, 1931 **7.81**	May, 1931 **7.81**	June, 1930 **7.77**	June, 1931 **7.81**	July, 1926 **7.35**
Electric Railway Materials* 1913 = 100	June, 1931 **116**	May, 1931 **118**	June, 1930 **139**	Dec., 1926 **159**	June, 1931 **116**
Electric Railway Wages* 1913 = 100	June, 1931 **233.0**	May, 1931 **233.2**	June, 1930 **231.7**	Apr., 1931 **233.2**	June, 1926 **225.5**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	June, 1931 **184**	May, 1931 **185**	June, 1930 **200**	Nov., 1928 **206**	June, 1931 **184**
General Construction Cost Eng'g News-Record 1913 = 100	June, 1931 **187.2**	May, 1931 **189.3**	June, 1930 **203.4**	Jan., 1927 **211.5**	June, 1931 **187.2**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	May, 1931 **71.3**	Apr., 1931 **73.3**	May, 1930 **89.1**	May, 1926 **100.5**	May, 1931 **71.3**
Wholesale Commodities Bradstreet 1913 = 9.21	June, 1931 **8.64**	May, 1931 **8.91**	June, 1930 **10.77**	Jan., 1928 **13.57**	June, 1931 **8.64**
Retail Food U. S. Bur. Lab. Stat. 1913 = 100	May, 1931 **121.0**	Apr., 1931 **124.0**	May, 1930 **150.1**	Dec., 1926 **161.8**	May, 1931 **121.0**
Cost of Living Nat. Ind. Conf. Bd. 1923 = 100	Apr., 1931 **88.2**	Mar., 1931 **89.1**	Apr., 1930 **98.7**	April, 1926 **105.5**	Apr., 1931 **88.2**
General Business The Business Week Normal = 100	June 6, 1931 **78.5**	May 9, 1931 **78.7**	June 7, 1930 **91.3**	Oct. 6, 1928 **117.6**	Jan. 31, 1931 **77.0**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	May, 1931 **109.8**	Apr., 1931 **106.4**	May, 1930 **119.0**	Feb., 1929 **140.4**	Jan., 1931 **97.6**
Bank Clearings Outside N. Y. City 1926 = 100	May, 1931 **68.6**	Apr., 1931 **76.0**	May, 1930 **92.1**	Oct., 1929 **111.8**	May, 1931 **68.6**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Material Prices

JUNE 26, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	8.50
Lead	4.25
Nickel, ingot	35.00
Zinc	3.90
Tin, Straits	24.10
Aluminum, 98 to 99 per cent	22.90
Babbitt metal, warehouse	
Commercial grade	33.25
General service	28.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{9}{16}$-in. and larger, per 100 lb.	2.70
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, 6m.x 8m.x8 ft.,	
White Oak, Chicago	1.35
Long leaf pine, New York	1.00

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	7.00–11.00
Colored	7.00–10.00

Wire—New York

Bare copper wire, cents per lb.	10.25
Rubber-covered wire, No. 14, per 1,000 ft.	$4.22
Weatherproof wire base, cents per lb.	12.125

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	8.90
White lead in oil (100lb. keg), cents per lb.	13.25
Red lead in oil	14.75
Turpentine (bbl. lots), cents per gal.	54.00
Putty, com'l grade, 100 lb. tins, cents per lb.	2.75

Hardware—Pittsburgh

Wire nails, per keg	$1.80
Sheet iron (24 gage), cents per lb.	2.15
Sheet iron, galvanized (24 gage), cents per lb.	2.75
Auto body sheets (20 gage), cents per lb.	3.05

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	.85
Kansas screenings, Kansas City	1.50
Big seam, Ala., mine run	1.70
Smokeless mine run, Chicago	1.60

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$120.00
Wood block paving 3½, 16 lb. treatment, N.Y., per sq.yd., f.o.b.	2.50
Paving brick, 3½x8½x4, N.Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., whosesale, f.o.b. per cu.yd	1.75
Cement, Chicago, in carload lots, without bags, f.o.b.	1.35
Gravel, ¾-in., cu.yd., wholesale, f.o.b.	1.60
Sand, cu.yd., wholesale, f.o.b.	1.00
Asphalt, in pkg. N.Y., f.o.b. ref., per ton	15.00

Scrap—New York

Heavy copper, cents per lb.	6.00
Light copper	5.00
Heavy brass	3.00
Zinc	1.25
Lead, heavy	2.60
Mixed babbitt	2.88
Battery lead plates	1.13
Cast aluminum	9.50
Sheet aluminum	10.00
Auto radiators	3.00
Tires, standard, mixed, per ton	$5.00
Inner tubes, mixed, per cwt.	$1.20

Old Material—Chicago

Steel car axels, net ton	$11.75
Cast iron car wheels, gross ton	10.25
Steel car wheels, gross ton	10.00
Leaf springs, cut apart, gross ton	11.25
Angle bars, gross ton	9.50
Brake shoes, net ton	5.75
Steel rails (short), gross ton	11.25
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	3.75
Coil springs	11.75

can Speed be coupled with Safety?

The populace of every city in the country is clamoring for accelerated movement of vehicles.

With this increased speed comes increased accident hazards. And with increasing traffic hazards you need emergency brakes that will act under any conditions.

Specify "Peacock" Staffless Brakes.

NATIONAL BRAKE CO., INC.

Canadian Representative
Lyman Tube & Supply Co., Ltd., Montreal, Can.

Buffalo, N. Y.

The Ellcon Company—General Sales Representatives
50 Church St., New York

100% SAFE

100% FAST

PEACOCK

STAFFLESS BRAKES

WHAT ABOUT YOUR TROLLEY POLES?

IN planning for greater efficiency in electric railway operation, the matter of trolley poles should be given careful consideration. When figuring the cost of service it will be well to study the construction of the trolley pole—what it can do from day to day in keeping down delays, avoiding traffic tie-ups and eliminating frequent replacements.

NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight and are, therefore, economical. A special form of reinforcement at the proper place gives the pole great strength, while the grade of steel used and a special heat treatment after drawing give a high elastic limit and assure long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.

NATIONAL SHELBY

US STEEL

NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.

QUALITY PRODUCTS — Dependable Service

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

Canton Motor Coach, Inc., Canton, Ohio, operates 75 city buses on Goodyear Tires

"More than 50,000 miles on GOODYEARS"

Long mileage isn't the only thing it takes to make a good tire for motor coaches. But it's one of the best indications that tires can run without trouble and keep passengers moving on schedule.

That's the case in Canton. "On some lines in our city-wide service, buses have traveled more than 50,000 miles on Goodyears and indications are that these tires are still good for many more miles. We have had very few road service calls, which is an important feature in building up and retaining the good will of the riding public."

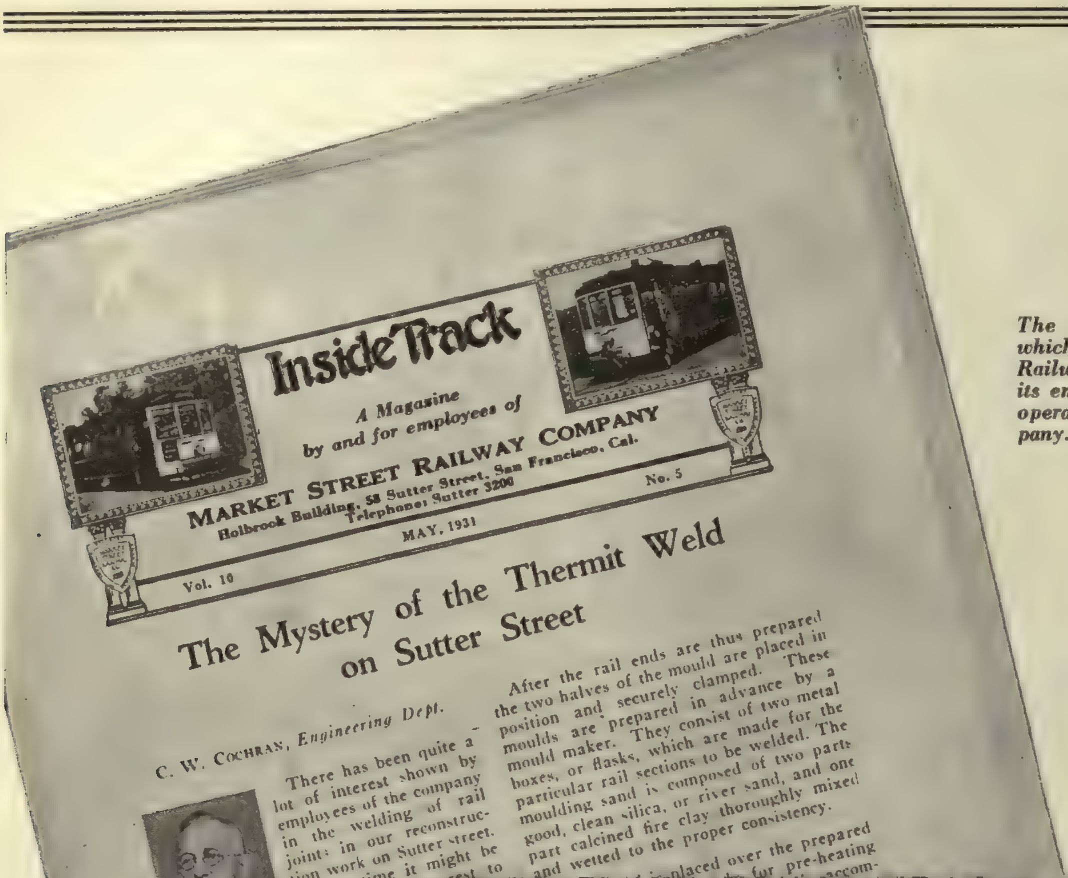
Whether you want safe, sure traction on hills, wet pavements or country roads—whether you want a tire stout enough to stand up under the speed of interstate runs—or a tire to roll out comfortable transportation on city streets—you'll find operations like yours which get what you want in Goodyears.

Find out why *more people ride on Goodyear Tires than on any other kind*—it's just as true of motor coaches as it is of passenger cars. The next time you order new equipment—specify delivery on Goodyears.

THE GREATEST NAME IN RUBBER

GOODYEAR

More Tons are Hauled on Goodyear Tires than on any other kind



Inside Track

A Magazine
by and for employees of
MARKET STREET RAILWAY COMPANY
Holbrook Building, 58 Sutter Street, San Francisco, Cal.
Telephone: Sutter 3200

Vol. 10 MAY, 1931 No. 5

The Mystery of the Thermit Weld on Sutter Street

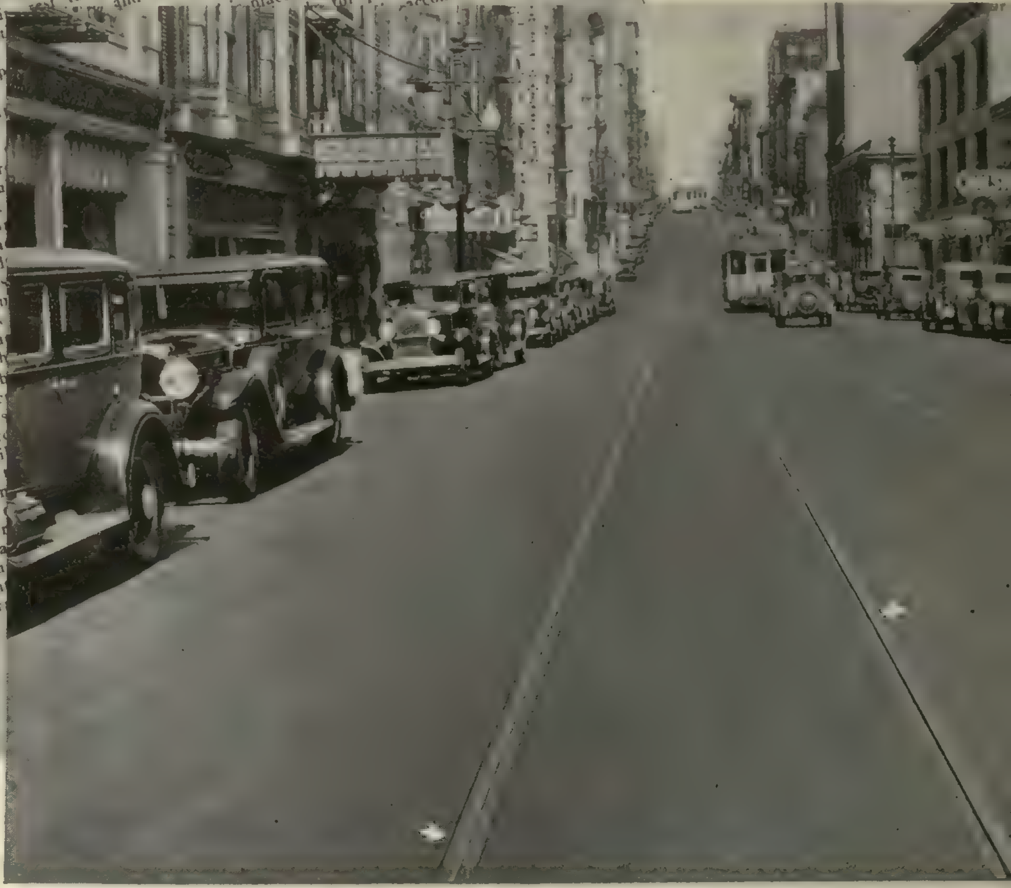
C. W. Cochran, *Engineering Dept.*

There has been quite a
lot of interest shown by
employees of the company
in the welding of rail
joints in our reconstruc-
tion work on Sutter street.
At this time it might be
of additional i
give a descript
various steps in the process.
insight into just what takes p
welding of a joint.
The first step is the prepa
rail ends to be welded.
cleaned of paint, rust or
matter to insure the best r
in the fusion of the meta
rails are laid in the track
between the ends of app
half inch. Into this spa
insert of the right wid
drive fit. The insert i
steel of the same chen
that in the rail. This
tinuous running surfa
in contact with car wh
The rail must be b
and surface and sec
ment by the use of
is most important, f
entirely on the rai
and surface while
way. After the m
slight movement
and were there
weld would be a
quire a lot of h
shape and migh
out a piece of r
tion.

After the rail ends are thus prepared the two halves of the mould are placed in position and securely clamped. These moulds are prepared in advance by a mould maker. They consist of two metal boxes, or flasks, which are made for the particular rail sections to be welded. The moulding sand is composed of two parts good, clean silica, or river sand, and one part calcined fire clay thoroughly mixed and wetted to the proper consistency.

placed over the prepared
for pre-heating
accom-

The "Inside Track" in which the Market Street Railway Company tells its employees about the operations of their company.



View on Sutter Street, San Francisco, taken May 27, 1931, after reconstruction had been completed. White arrows show location of two Thermit welded rail joints in foreground.

The
METAL & THERMIT

120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So. San Francisco Toronto

In *San Francisco* California

Market Street Railway Company Joins the list of users of . . . . .

THERMIT

"There has been quite a lot of interest shown by employees of the company in the welding of rail joints in our reconstruction work on Sutter Street," says Mr. Cochran, in his article in the "Inside Track," Company publication of the Market Street Railway. His article then goes on to describe the process of Thermit Welding as used on their lines. This is part of the $2,500,000 program of reconstruction and rehabilitation recently started by this important property. 106 lb. rail is being laid, with Thermit Welded joints.

Besides telling the story to its employees, the Market Street Railway Company placed posters in the cars to explain the improvements to the patrons of the road.

Thermit-Welding gives a smoother riding track because the rails are actually joined—not jointed. There is no gap, no rough spot left for the wheels to bump over. Welded solidly together, and ground to absolutely level smoothness, the rails form an unbroken path of steel which means smooth and quiet operation of cars. The Market Street Railway, like many other users of Thermit Welding, is pleased to point this out to patrons as one more step toward better public relations.

"Thermit Welding Under Traffic"—our new method of making welds without interrupting service, is being used on this job.

Thermit Welding is now being done at lower cost than ever before. It can be done under adverse traffic conditions if necessary. The time to do it . . . *is now!* Ask our nearest office for quotations.

CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto

REO QUALITY IN THE LOWEST PRICED TRUCK FIELD

NEW 1½ TON REO

. . . with a wide range of Reo bodies to fit your needs

In the entire field of low price trucks, only the new 1½-Ton REO SPEED WAGONS embody all these excelling features:

Powerful 4 and 6 cylinder truck engines with *five* and *seven* bearing crankshafts; maximum piston displacements; full force feed oiling even to the piston pins; chrome nickel cylinders that wear seven times longer; extra large 7" deep frames; full floating rear axles; long, heavy springs; Spoksteel wheels; and large internal, self-equalizing hydraulic brakes!

Wheelbases are longer, with greater loading spaces back of the cab. With this sturdy chassis, Reo is prepared to supply every popular type of panel, stake, express or dump body—also special types for special needs. Prices are low and quality extraordinary.

A drive under load—over test routes of your own choosing—will tell more about the smooth, powerful action of these new Speed Wagons than words could possibly convey. Note carefully the savings in time and gas—and the *exceptional* size and strength of vital parts.

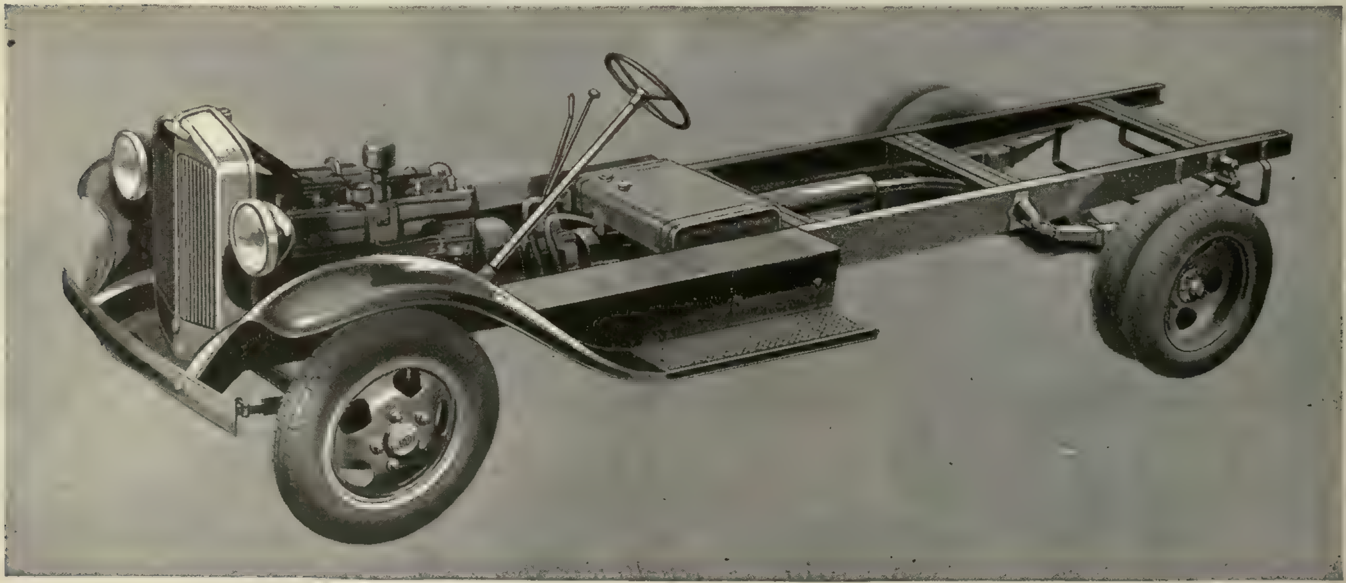
Any Reo salesman will gladly show you a portfolio which proves, by illustrated life-size comparisons of parts, the real and indisputable margin of Reo superiority.

By all means, see this SPEED WAGON before you buy!

$625

Four-Cylinder $625, Six-Cylinder $725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

REO MOTOR CAR COMPANY
LANSING — TORONTO



HARD NUTS

for strenuous Railroad Service

NESMITH PHOTO

. . . Another R B & W Standard

The titans of the rails get as much solicitous attention as a thoroughbred race horse. A locomotive's life is crowded with cleaning, oiling, adjusting.

Important, if small, accessories in an engine's daily work are the nuts that must be frequently adjusted to a nicety to maintain smooth operation.

R B & W Case Hardened Nuts are standard on American locomotives. Builders feel they can not afford to take chances on ordinary nuts.

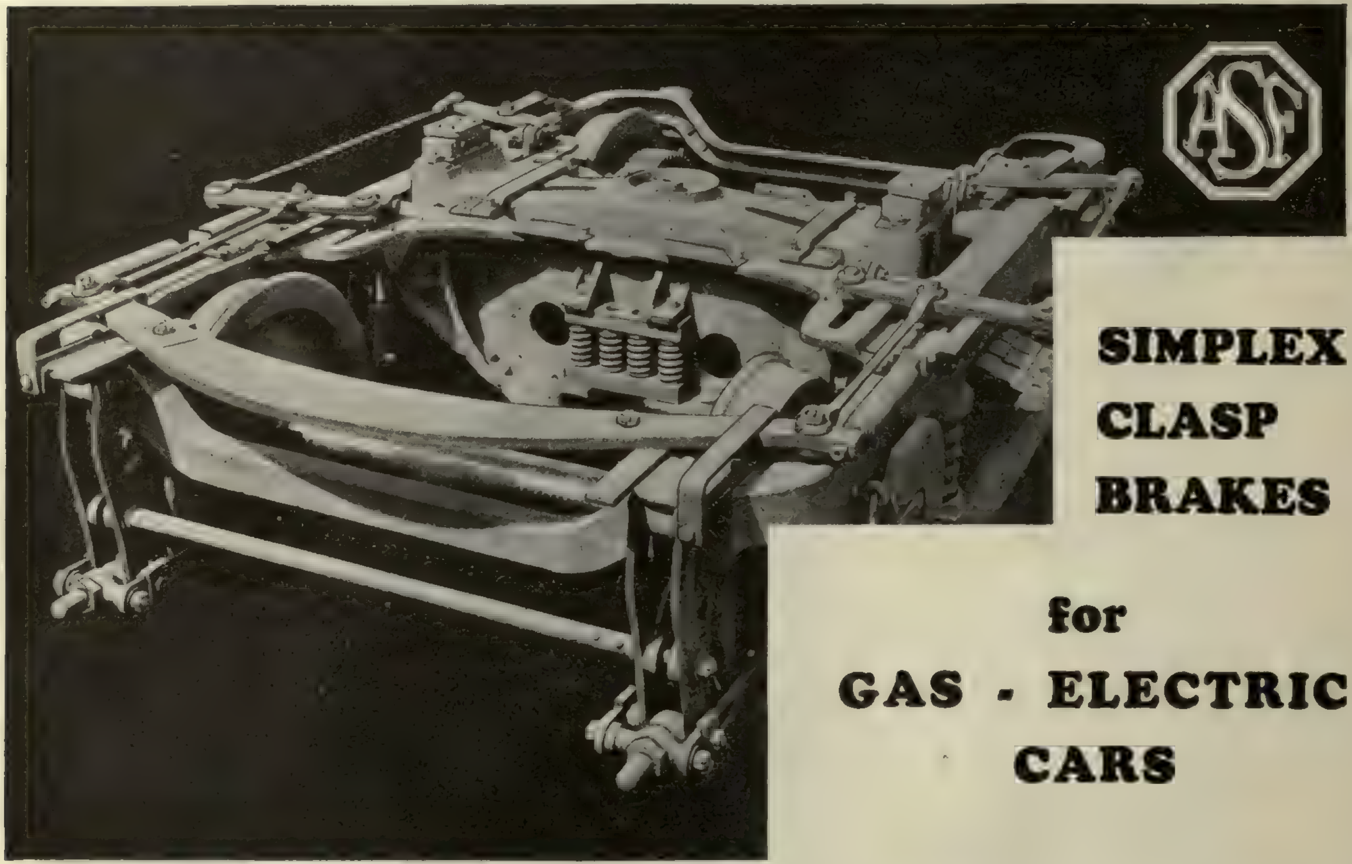
Once a prominent locomotive builder sent us his first order for case hardened nuts with a specification so rigid that it was commercially impractical, and would have impaired the strength of the threads. Investigation by the R B & W Engineering Service discovered the locomotive builder had had much trouble with such nuts bought from other sources. The changed specifications we recommended resulted in a nut so satisfactory that not another complaint has been received. Now this customer wouldn't think of entrusting his case hardened nut orders to anyone but R B & W, because the EMPIRE Brand stands up under the rigorous service demanded.

Use the R B & W Engineering Service when you plan or redesign bolting material.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

ROCK FALLS, ILL. PORT CHESTER, N. Y. CORAOPOLIS, PA.

Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.



SIMPLEX CLASP BRAKES

for

GAS - ELECTRIC CARS

RAILROADS of the country are using American Steel Foundries Clasp Brakes for passenger equipment.

Greater retardation; reduction in brake shoe wear; desirable balancing of braking forces—all have proved the value of Clasp Brakes.

Gas-electric cars have increased in weight and size until they now are frequently larger than standard passenger cars. For these reasons, they, too, need Simplex Clasp Brakes. Clasp Brakes are applicable to Gas-Electric Car Trucks and should be included in your specifications.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

ROEBLING

When you need signal wires and cables—or any other types of wires and cables for electric railway use—remember that Roebling makes all. In fact, the Roebling Line ranges from magnet wire for winding coils to heavy High Tension Lead Sheathed Power Cables.

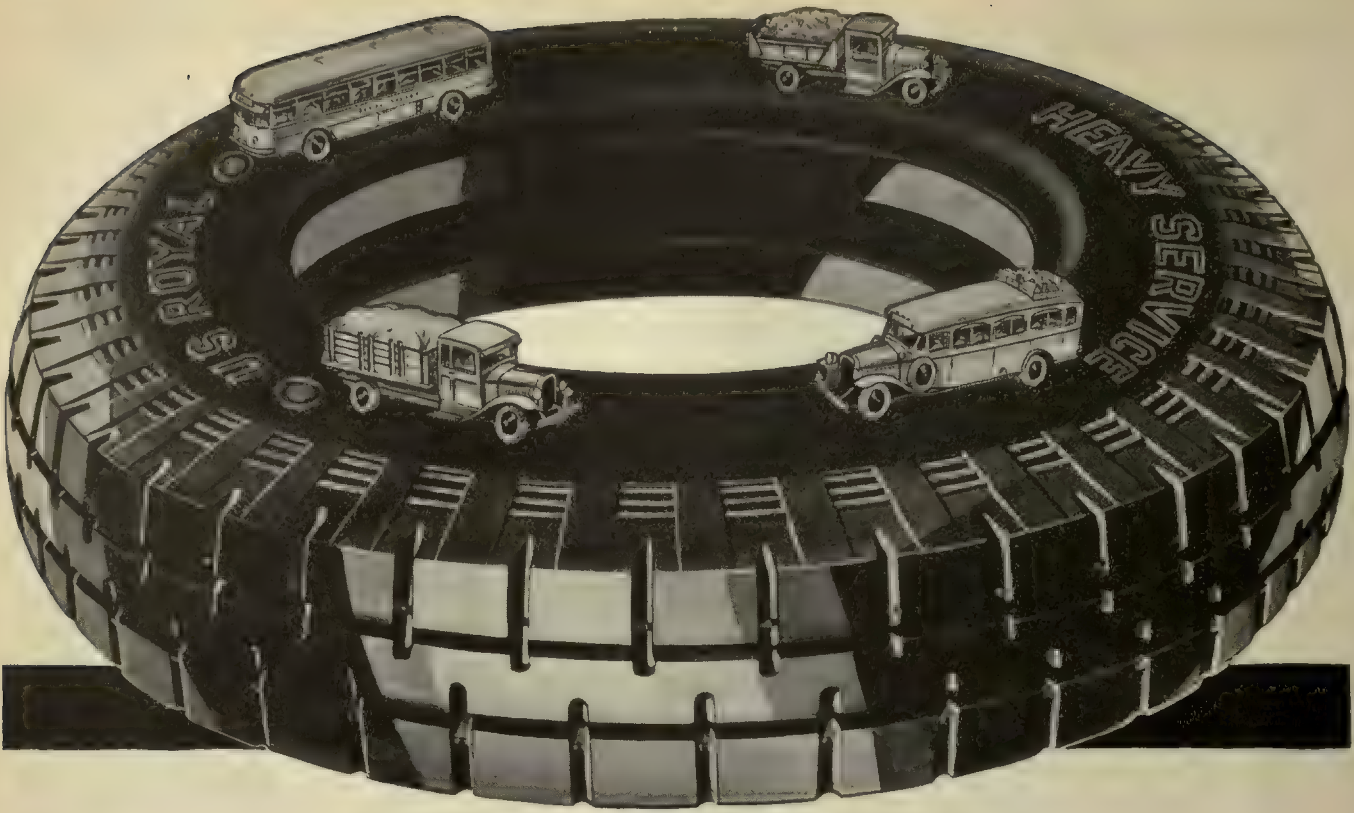
Roebling is equipped to give you prompt service, too. Quick shipment of standard types of wires and cables can be made from all warehouse points below.

We would be glad to have an opportunity to furnish information and prices regarding any of the Roebling Wires and Cables listed.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
Atlanta Boston Chicago Cleveland Los Angeles New York
Philadelphia Portland, Ore. San Francisco Seattle Export Dept.—New York, N.Y.

Railway Signal Wires and Cables » Parkway Cables » Power Cables; Paper, Cambric, Rubber; Braided or Leaded » Car Wire » Locomotive Wire » Bronze Trolley and Contact Wire » Copper Trolley and Contact Wire » Copper Transmission Strand » Guy Wire and Strand » Bond Wires » Ground Wires » Welding Cable; Trailing and Electrode Holder » And a wide variety of other Wires and Cables.

ELECTRICAL WIRES AND CABLES



REDUCING OVERHEAD FOR TRUCK AND BUS OPERATORS

By millions of miles of tested service—every conceivable road and load—U. S. Heavy Service truck and bus tires have demonstrated their outstanding superiority. The U. S. Rubber Company—World's Largest Producer of Rubber—is able to maintain quality from source to finished product—"from tree to truck." The extra mileage, which truck and bus operators from coast to coast have come to associate with U. S. Tires, is assured by exclusive U. S. features of construction found in no other tire. That's why

THE BIG SWING IS TO U. S. TIRES

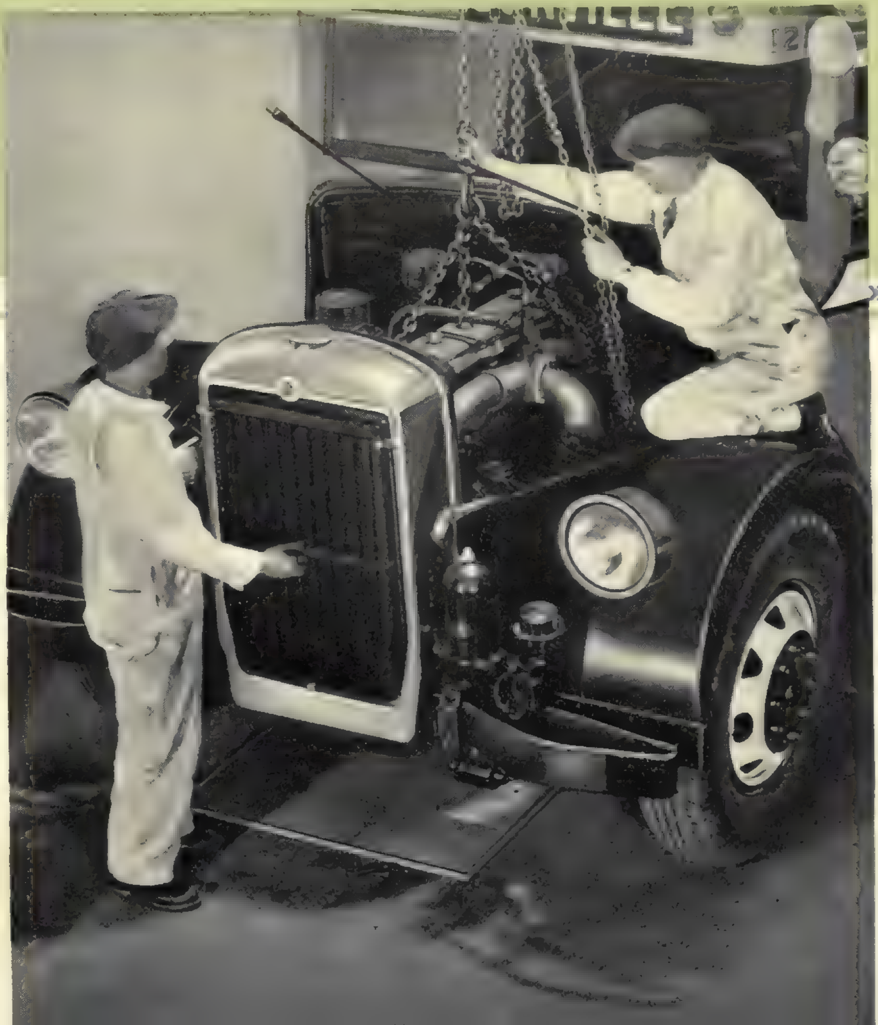
United States Rubber Company

WORLD'S LARGEST PRODUCER OF RUBBER

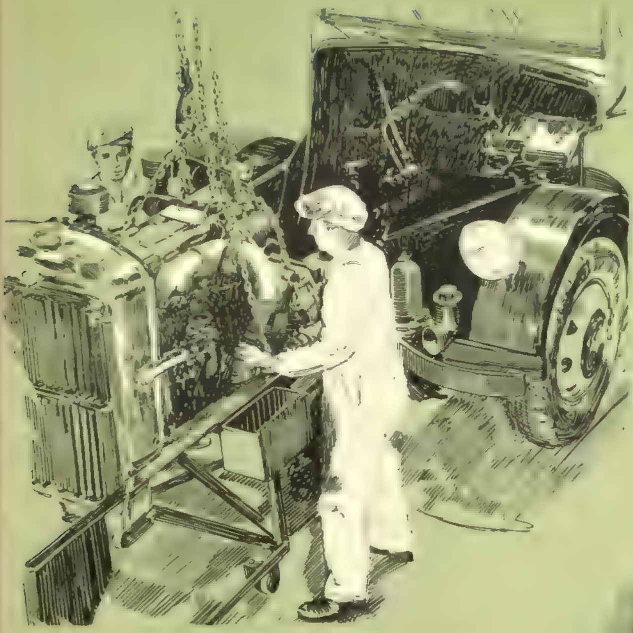
YELLOW *announces*

Type 250

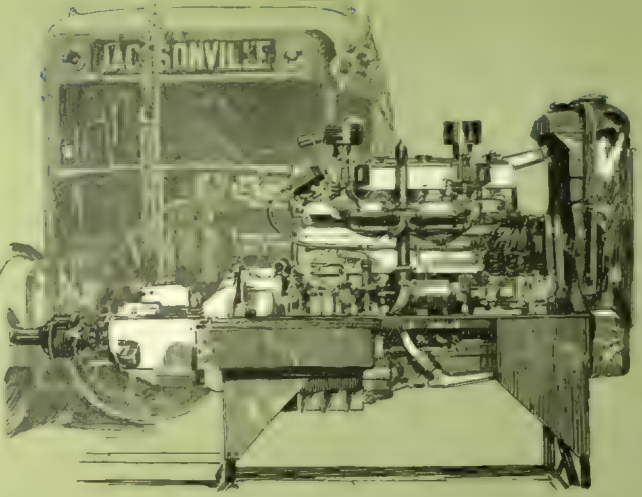
now available with quick removable power plant and many added refinements



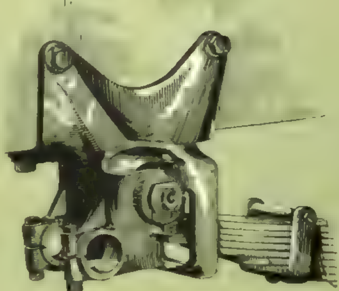
One of the most important of the new refinements incorporated in the new Type 250 design is the quick removal and replacement of the radiator, engine, clutch and transmission as a single unit. This entire assembly can be removed by two men in less than ten minutes and can be replaced in less than twenty minutes.



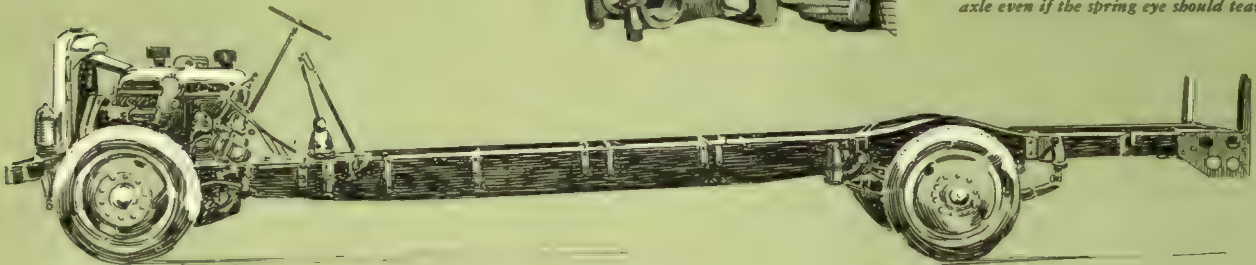
Without disturbing any adjustment or even removing the water from the radiator, two men can remove and replace the entire power plant assembly, including radiator, engine, clutch and transmission as a unit, in the same amount of time ordinarily required to replace a radiator.



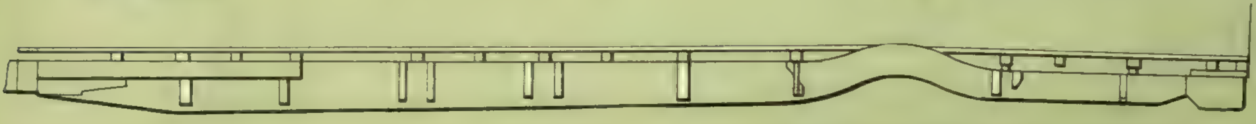
The power plant unit is rolled, not lifted, out of the frame. All connections, including exhaust line, and fuel leads to the engine are quickly demountable and no adjustments are affected. By means of special connector blocks all wiring, including ignition and generator wiring and starter leads, can be instantly disconnected.



This new spring design and spring mounting insures against delays from spring failures. The two top leaves of each spring are wrapped and the third leaf partially wrapped around the eye of the springs. An encircling retaining bracket on the unshackled end of the front spring assures alignment of the front axle even if the spring eye should tear out.



The frame has been straightened so that it parallels the floor ramp. This eliminates the usual high kick up and provides better seating arrangement at the wheel housing. The strength of the frame has been increased materially by extending and bending the lower flanges downward at points where maximum stresses occur.



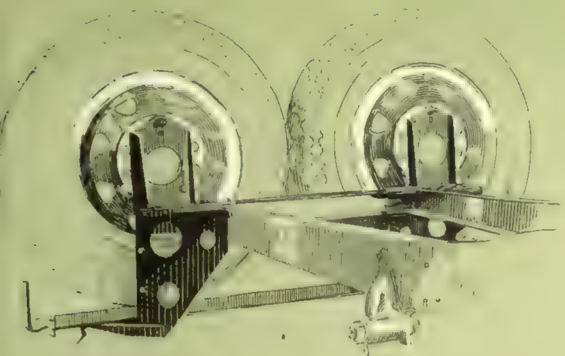
The frame now parallels the slope of the floor ramp.

Again Yellow sets

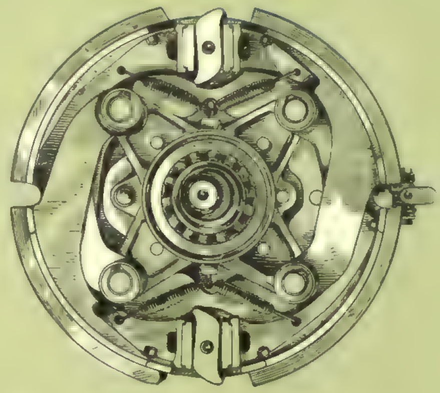
Less than 18 months ago, Yellow set a new pace in motor coach design when the transcontinental Type 250 Parlor Coach was introduced. Instant and enthusiastic recognition followed. The country's largest and most successful operators were quick to value its advanced engineering improvements, its rider appeal and comfort, its smooth power and exceptional performance, its low maintenance cost and high revenue earning ability.

Never has there been a coach design more universally satisfactory.

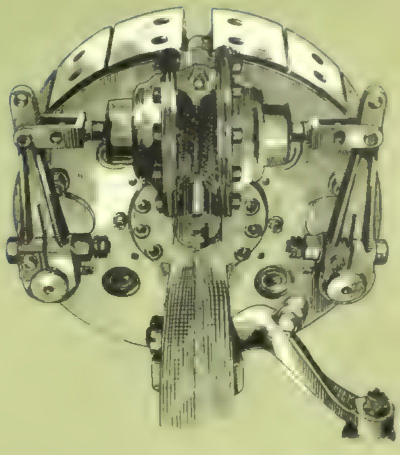
Today Yellow announces the addition of many notable refinements but no changes in the fundamental design of this popular model —features which add still further to its low cost of operation and ease of maintenance



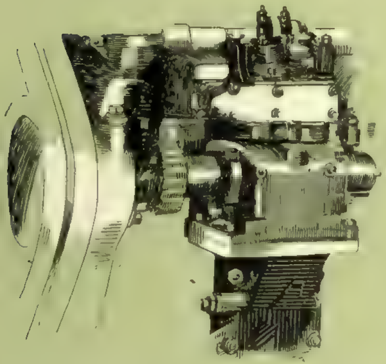
The frame side rails have been extended to form a support for the carrier for spare tires and direct fastening for the rear bumper. Thus the body structure is freed of the usual spare tire load.



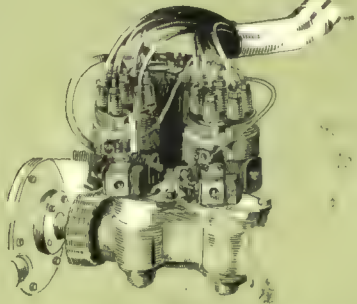
Brakes are of four-wheel type. Brake shoes, blocks, drums and slack adjusters are interchangeable, front and rear. The actuating brake parts in each wheel are of the duplex type and consist of four shoes simultaneously operated by two cams.



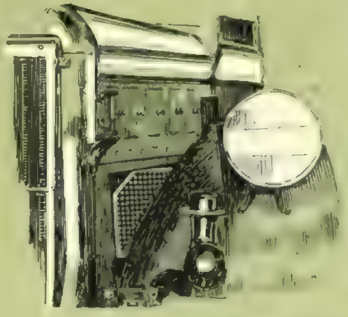
The brake shoes are actuated by double acting brake chambers, each single diaphragm actuating two shoes. With this improved design, brake area is increased to 676 square inches and efficient braking is obtained with air pressures as low as 35 pounds. Drums are of nickel iron, 17¼ in. diameter, 4 in. wide, with ventilating, reinforcing ribs.



The compressor is direct mounted to the engine and quickly detachable. It is driven by dual belts and is automatically lubricated from the engine lubricating system.



Accessibility is a noteworthy feature of the dual ignition assembly. Condensers are mounted to the hood side of the distributors.



A ventilating duct leads cool air to under side of driver's pedal plate.

» »

the pace

and to its extraordinary performance characteristics.

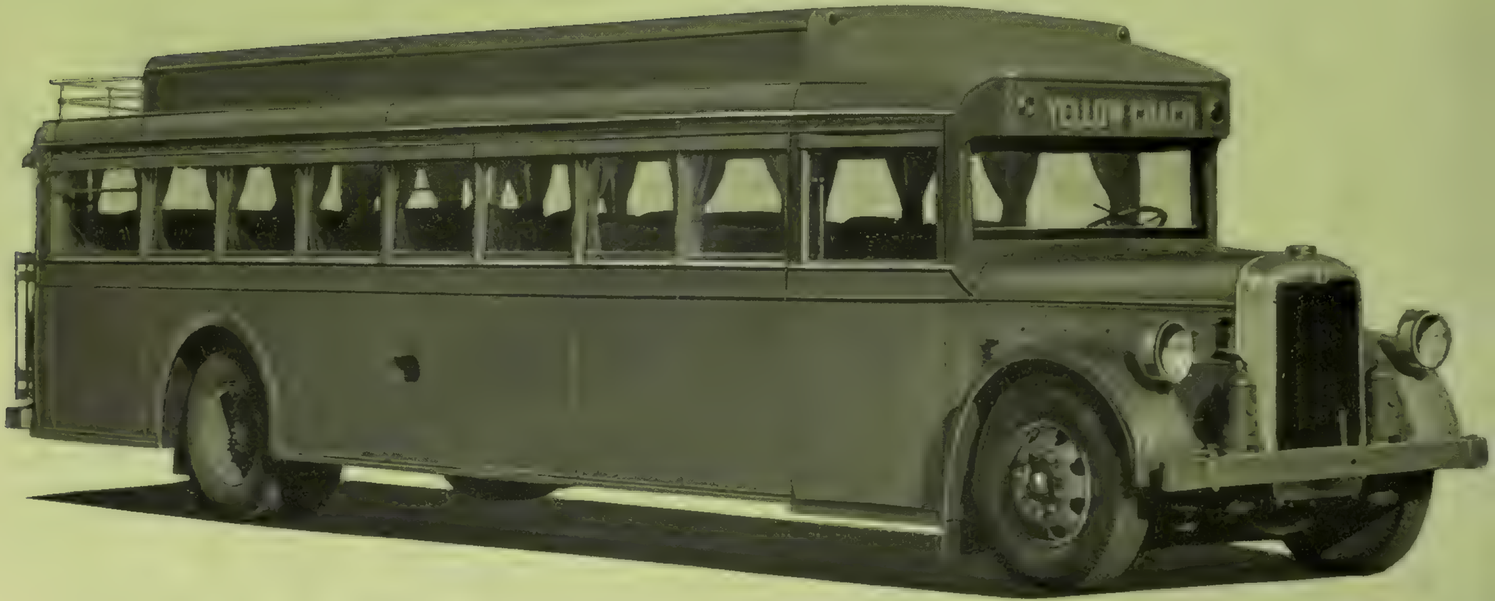
The power plant is the same but the famous "616" engine can now be removed by two men in less than ten minutes—can be replaced in less than twenty minutes. The frame has been made straighter, with less kick up, and stronger and more rigid. Brake adjustment and maintenance has been greatly simplified.

The spring construction and mounting has been improved and a special feature added that protects against road delays from spring breakage.

From radiator to tail light, every unit and part has been meticulously studied and the original design refined or improved, made lighter or stronger or more accessible as directed by operating experience and sound engineering practice. No detail has been overlooked that would contribute to longer service life, improved performance or simplified maintenance.

YELLOW *Coaches*

type 250



In outward appearance there is little change between the newest Type 250 and the original model introduced eighteen months ago.

But on the road and in the shop the value of the many refinements which have been added will be convincingly reflected in lower operating costs.

In thus refining to still higher peaks of performance, long life and low cost maintenance a model which has proven universally and exceptionally satisfactory to the industry, Yellow Coach again demonstrates its will to improve and its persistent determination to achieve perfection so that the future of highway transportation will be fully assured.

GENERAL MOTORS TRUCK CO., *Pontiac, Michigan*
Subsidiary of Yellow Truck & Coach Mfg. Co.

DeVilbiss

HEADQUARTERS FOR SPRAY-PAINTING AND FINISHING EQUIPMENT FOR ELECTRIC RAILWAYS

THE close adaptation of DeVilbiss Spray-painting and Spray-finishing Equipment to the needs of electric railways is graphically illustrated in the many kinds and types of surface coatings which can be spray-applied economically, quickly and efficiently.

All liquid or semi-liquid coatings, from the lightest stains to the heaviest viscous compounds, are within the range of DeVilbiss Equipment. Lead and oil, ready mixed paints, asphaltums, rust and water proofing compounds are as easily handled as glazes, shellacs, lacquers, mill whites or similar materials. In fact, there is no liquid coating, whether protective or decorative, which cannot be easily handled by DeVilbiss Equipment.

The wide line of DeVilbiss Spray-painting and Spray-finishing devices and accessories should be familiar to every electric railway executive, for there is no equipment which electric railways can buy which will so materially reduce maintenance and upkeep costs.

THE DeVILBISS COMPANY . TOLEDO, OHIO

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS LOS ANGELES SAN FRANCISCO WINDSOR, ONTARIO

Direct sales and service representatives available everywhere

The wide DeVilbiss Line embraces every outfit and accessory for spray-painting and spray-finishing

The SAFETY CAR CONTROL EQUIPMENT . . .

∽ PROVIDES Greater Convenience

INTERLOCK of brakes with doors, by means of a common operating valve, simplifies manipulation, and the selective door control feature, which permits treadle control of rear exit, insures prompt and flexible passenger interchange under varying traffic conditions.

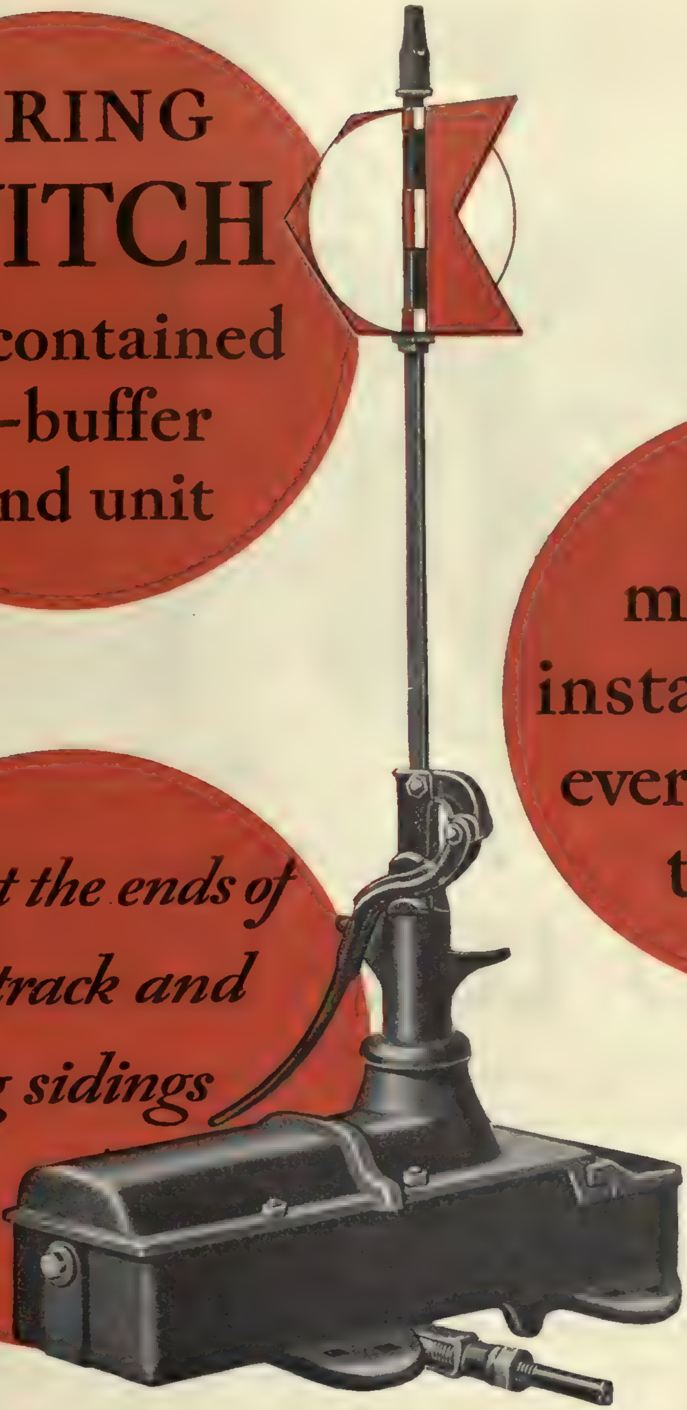
SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH

3136

SPRING SWITCH
self-contained oil-buffer stand unit

Saves more than installation cost every month of the year

used at the ends of double track and passing sidings



3-IN-1 SWITCH STAND STYLE NO. 100-A

After severe tests at such locations, many of the leading roads have now adopted the 3-in-1 switch stand as standard. None of the claims we have made for this stand were disproved during these tests. The 3-in-1 was especially designed for use at the ends of double track and passing siding. Its three features, all combined in one compact housing, are:

1. A rigid-throw always ready for hand operation.
2. Two automatic double-coil springs returning points after trailing train has passed.
3. An oil-buffer preventing return of points between successive pairs of wheels.

This is the first switch stand to combine all these features in one compact housing; in throwing it *cannot* be closed and locked when an object intervenes between the points and the stock rail. Many locations on your railroad need this switch stand. Write today for complete printed information about the 3-in-1.

RAMAPO AJAX CORPORATION

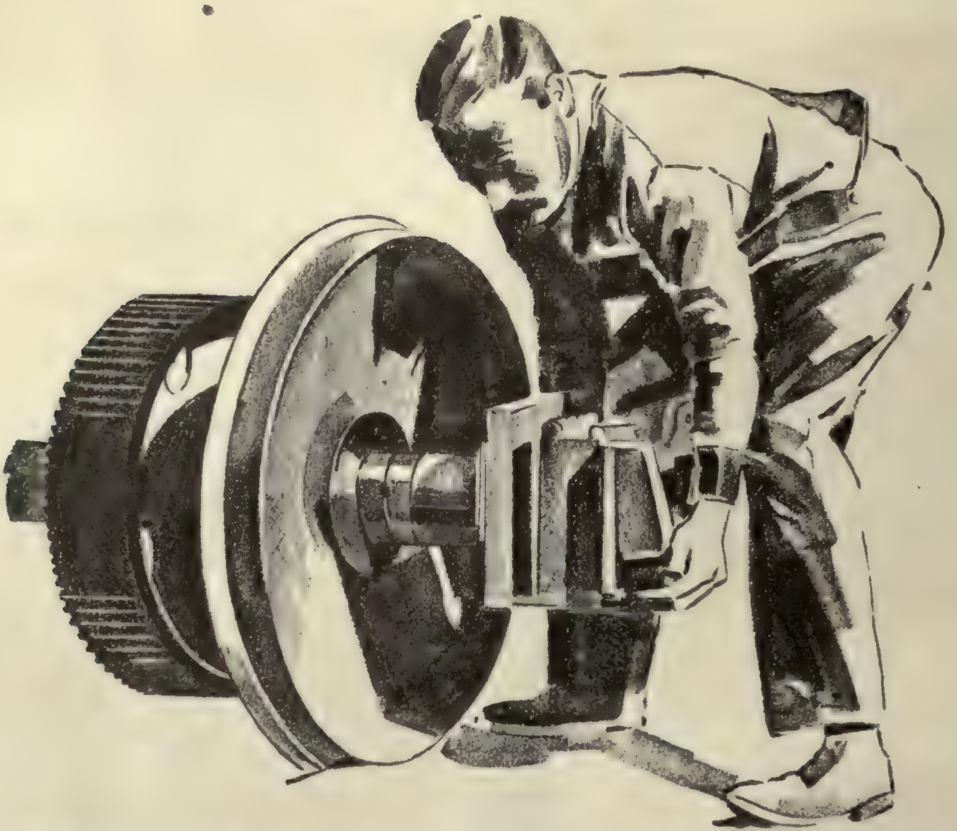
Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . . Niagara Falls, Ontario

General Offices—230 Park Avenue, New York

Sales Offices at Works and McCormick Bldg., Chicago Midland Bank Bldg., Cleveland, Ohio Builders Exchange Bldg., St. Paul Metropolitan Bank Building, Washington Union National Bank Building, Houston, Texas

Nine Racor Works: Hillburn, N. Y. Niagara Falls, N. Y. Chicago, Ill. East St. Louis, Ill. Superior, Wis. Pueblo, Col. Los Angeles, Cal. Seattle, Wash. Niagara Falls, Ont.

RACOR



ROLLING-STOCK PURCHASERS SPECIFY

TEXACO LUBRICATION

A number of rolling-stock purchasers in the Electric Railway Industry who have made tests of the new Texaco System of Journal Lubrication (of which Texaco Lovis Oil and Texaco Oil Seals are important elements) are now specifying this new Texaco System of Journal Lubrication for the new cars they order.

The tests made by these purchasers of rolling-stock proved exactly what The Texas Company's own tests have proved, namely:

The Texaco System of Car-Journal Lubrication gives more effective lubrication—*and does it at less cost.* Oil-house costs are less. Waste consumption is greatly reduced. Shop time for journal truing and bearing replacements is lower; and pull-ins due to bearing troubles are practically unknown. With the Texaco System, power consumption per car-mile is decidedly less.

There are two reasons for these economies. First: Texaco Oil Seals permanently seal the journal box against the entrance of abrasive dust and water, and second: Texaco Lovis Oils have definitely proved more effective lubricants than the high-viscosity oils formerly used.

Write The Texas Company. Texaco engineers will gladly lay the facts before you, or arrange for thorough tests on your own lines. The Texaco System of Car-Journal Lubrication is now used by an increasing percentage of the country's electric railways.

TEXACO LUBRICANTS

THE TEXAS COMPANY, 135 EAST 42nd STREET, NEW YOR

for all traction equipment...

TIMKEN AXLES

FRONT *and* WORM DRIVE REAR

Strong, long-lived, *and*
permanently silent

THE TIMKEN-DETROIT AXLE COMPANY DETROIT MICHIGAN

1881

ANNOUNCING THE GOLDEN JUBILEE CONVENTION NUMBER OF ELECTRIC RAILWAY JOURNAL

50th ANNUAL CONVENTION

Golden Jubilee

of the A. E. R. A. ATLANTIC CITY Sept. 26—Oct. 2

AT Atlantic City, September 26 - October 2, the American Electric Railway Association will celebrate its 50th Anniversary by a Golden Jubilee Convention and Exhibit. A great occasion. The oldest memories will be revived; the newest developments displayed.

The Convention Number of ELECTRIC RAILWAY JOURNAL will contain an authoritative historical review of the industry's 50 years of progress, with interesting illustrations of early days.

This year, for the first time, the National Association of Motor Bus Manufacturers will hold their annual convention in conjunction with the A. E. R. A., September 28-29, at Atlantic City.

The Convention Number of ELECTRIC RAILWAY JOURNAL will be mailed to subscribers September 15—ten days before the convention—and will be distributed at the convention itself. Advertising forms close September 11.

ELECTRIC RAILWAY JOURNAL
McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th St., New York

1931

CONVENTION NUMBER

Electric Railway Journal

OUT SEPT. 15 **FORMS CLOSE SEPT. 11**

Monotube Pole with ornamental base used for distribution lines and trolley span wire support.

LET'S TALK about POLE COSTS

COSTS come in for plenty of attention these days. Every dollar must be stretched just a little farther.

About pole costs. Union Metal Monotubes fall in the low price range. Compare them with other steel poles—strength for strength—you'll find the prices right in line.

Then consider the advantages incorporated in Monotubes which you do not get in other poles—one-piece construction, no horizontal joints, choice of two types of anchorage, cold-rolled steel, better appearance—all for the same price as ordinary poles. And because Monotube construction reduces corrosion to a minimum, these poles last longer.

Install Monotubes jointly with other utilities. Use them for distribution lines, trolley span wires, feeder lines, traffic signals or what you will. Monotubes will cut costs for you year after year.

At whatever price you wish to pay for poles or for lighting standards, Union Metal offers you an outstanding buy. The line is complete. There is a pole—Monotube or Fluted Steel—and lighting standard—Pressed Steel or Ferronite (super cast iron)—to match every requirement of style and price. Write us for complete information or request a Union Metal engineer to call.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY ◆ ◆ CANTON, OHIO
SALES OFFICES: New York, Chicago, Boston,
Los Angeles, San Francisco, Dallas, Atlanta

Distributors:
General Electric Merchandise Distributors
Graybar Electric Company, Inc.
Offices in all principal cities

Abroad: The Canadian General Electric Co.;
The International General Electric Co. Inc.

UNION METAL MONOTUBE POLES

Moratorium!

Declared by TWIN COACH
as long as four years ago
in July, 1927

PROTECTION

MORATORIUM . . . is a word that fills the front pages of the world—meaning a suspension of PAYMENT.

Applied to Twin Coaches it means a suspension of OBSOLESCENCE PAYMENTS.

Such payments have been excessive due to frequent new bus models designed without proper regard for transportation problems to be met. On this basis, annually designs are brought out which obsolete early models before purchaser has had a fair chance to use the old vehicle.

New buses and improvements are a constant necessity but fundamental changes in design represent progress only when they are designed around and better meet the transportation problems confronting the railway operator.

Twin Coach policy during 1927, 1928, 1929, and 1930 has called for a standardization of design with a non-obsolescent body —and provided for the application of all improvements in the coach art upon the original vehicle in the owner's garage.

Furthermore, the Twin Coach standardization policy calls for the same relative design for all capacities with a maximum interchangeability of parts.

Today this idea fathered by Frank R. Fageol is acknowledged widely as the keystone of successful bus manufacturing, purchasing, servicing and operation.

Cold sales figures prove this assertion.

for the Buyer

SIGNED orders are the most authoritative endorsement of advertising statements.

In these times of the closest scrutiny of purchases — the Twin Coach policy of STANDARDIZATION with its ELIMINATION OF NEW MODELS has stood the severest of tests set up by the prospective purchaser.

RECENT ORDERS AND DELIVERIES

June Deliveries . . .	$500,000.00
June Orders (*Undelivered*) .	1,500,000.00
Grand Total	$2,000,000.00

All Twin Coach products are manufactured under patents issued or pending.

Proof!

you can't beat twins

NEW ACCOUNTS FOR JUNE

26 *Seater Twins*

KANSAS CITY . . . . MISSOURI
Kansas City Public Service Co.

KNOXVILLE . . . . TENNESSEE
Tennessee Public Service Co.

WILLIAMSPORT . . . PENNSYLVANIA
Willliamsport Transportation Co.

DULUTH . . . . MINNESOTA
Duluth Street Railway Co.

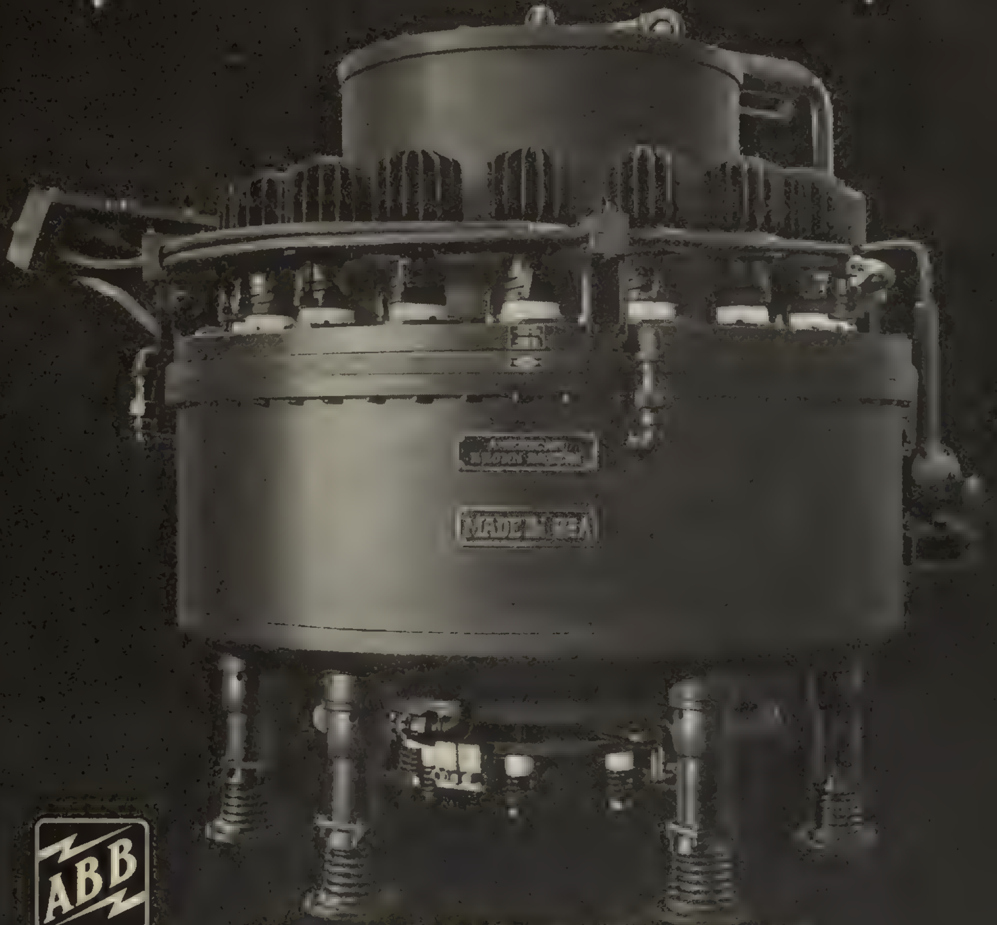
READING . . . . PENNSYLVANIA
Reading Transit Bus Co.

The secret of this operating success lies in the fact that these smaller capacity Twin Coaches are built of the same materials and of the same units (single motor) used and developed thru four years of manufacturing the famous 40-passenger Twin Coaches of a standard basic design—which eliminates the troubles so frequently the result of redesigning from year to year to bring out new type motor coaches.

Twin Coach
BY F.R. FAGEOL — KENT, OHIO

SILENT

and more efficient



ABB

3000 KW Mercury Arc Rectifier
for 600 volt Railway Service

AMERICAN BROWN BOVERI CO., INC., CAMDEN, N. J.

AMERICAN BROWN BOVERI

Pioneers in Mercury Arc Power Rectifiers

WHERE INSULATION MUST BE DEPENDABLE
Using Vartex Varnished Cambric Tape in the manufacture of an AMERICAN BROWN BOVERI 10,000 K.V.A. Transformer.

VARTEX
TRADE MARK
THE PEAK OF QUALITY

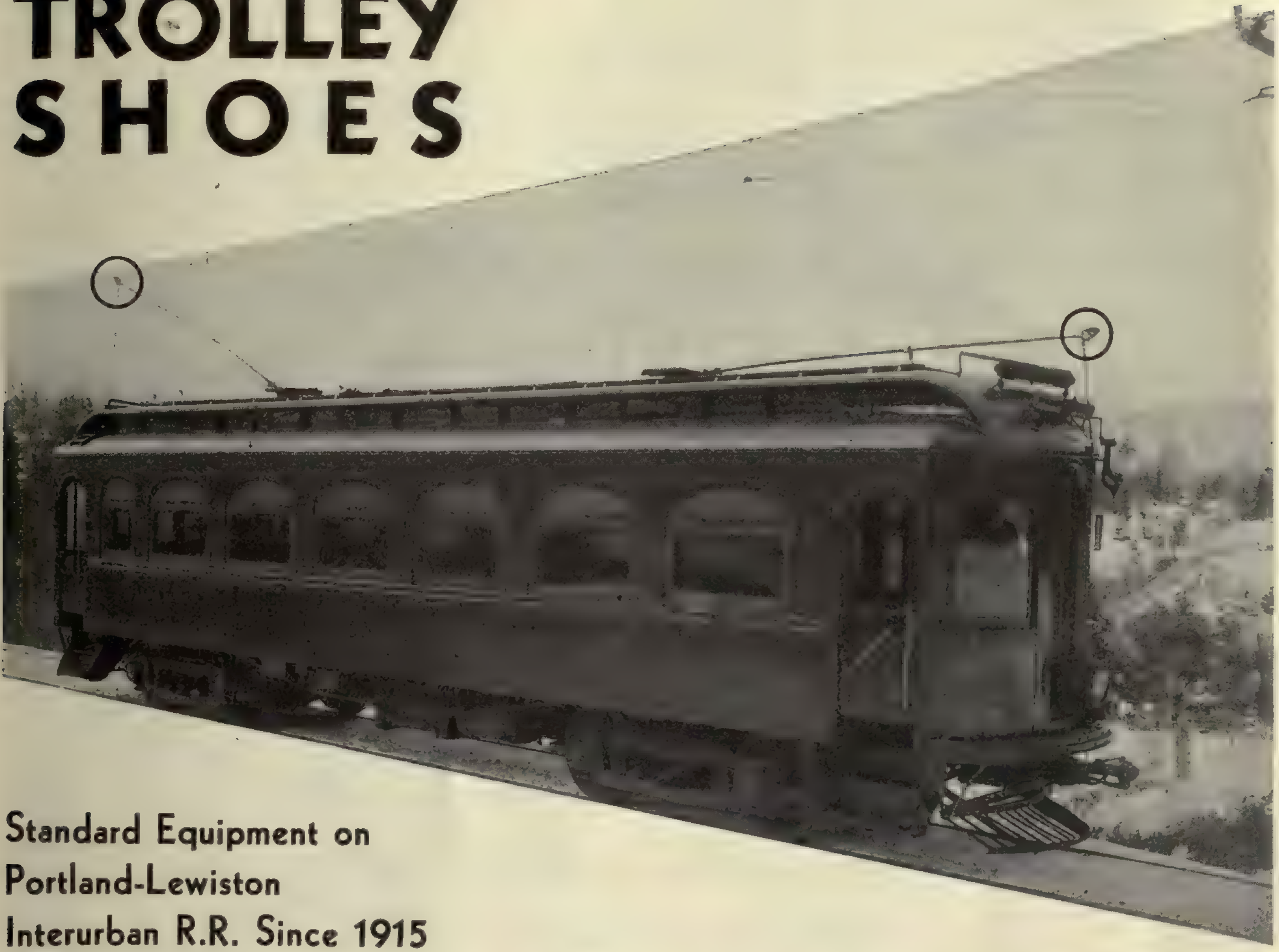
VARTEX—for Dependable Insulation

The light and power supply of whole communities often depends on the unfailing performance of such transformers as the one illustrated here. Only the finest materials can be considered for their construction.

There can be no better proof of the high quality of Vartex Varnished Cambric Insulation than is afforded by its selection by American Brown Boveri Co., Inc., for this exacting service.

NEW JERSEY WOOD FINISHING CO., INC.
FOUNDED 1907
ELECTRICAL INSULATION DEPARTMENT
Woodbridge New Jersey

MILLER TROLLEY SHOES



**Standard Equipment on
Portland-Lewiston
Interurban R.R. Since 1915**

This company has been using these smooth running sliding contact shoes for over fifteen years. At that time they abandoned trolley wheels because of frequent dewirements and high replacement expense.

To quote Mr. P. E. Weymouth, general superintendent: "We are operating heavy interurban equipment with heavy motors on a high gear ratio, so that a heavy current is required, particularly in starting and on grades. On account of this we believe that a sliding contactor of some kind is necessary for satisfactory operation. The Miller Trolley Shoe was adopted and has proved to be very satisfactory."

Miller Trolley Shoes are helping to reduce costs for many of the leading traction companies in all parts of the country.

Write for descriptive literature and quotations.

MILLER TROLLEY SHOES provide 3 inches of smooth running sliding contact surface. They are especially adapted to draw heavy current at high speeds without arcing. Users report fewer dewirements and less wear of trolley wire.

MILLER TROLLEY SHOE CO.

Columbia Road Boston 21, Mass.

INSULATING MATERIALS

The dependability of electrical apparatus is determined often by the quality of its insulating materials. General Electric, to insure this dependability, manufactures the Insulating Materials used in its many products. These same Insulating Materials that are manufactured, used, and recommended by the General Electric Company can be obtained from your nearest General Electric Merchandise Distributor. See him, or write Section M-317, Merchandise Department, Bridgeport, Connecticut.

GENERAL ELECTRIC

INSULATING MATERIALS

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

Sweep Away Excess Dead-weight

with Structural Shapes and Sheets of Alcoa Aluminum

It's time to clean house of dead-weight. The keynote of a new program of progress and profit in street car construction is to build of the strong alloys of Alcoa Aluminum, equivalent in strength, but only 1/3 the weight of structural steel.

You can scrap tons of dead-load in every car. Dead-load that pays no fares. Get away to quicker starts; make easier stops; increase your schedules; save wear and tear on tracks and road beds; provide more riding comfort.

The additional cost to accomplish this is soon paid off—forgotten entirely as being of no consequence, as compared with the increased profits resulting from lower operating costs.

Standard structural shapes made of the strong alloys of Alcoa Aluminum, equal in strength to structural steel, yet weighing only 1/3 as much, are available from stock in depths up to 10 inches and in lengths up to 90 feet. Plates, rivets, bolts and screws are also available.

In the form of sheets, castings and forgings, the strong alloys of Alcoa Aluminum can be used in cars to save the weight of roofs, side and floor members, panels, seats, conduit, doors and fittings.

The engineering handbook, "Structural Aluminum," is available at $1.00 a copy. Address ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

In Fargo Coaches All these features

In Fargo Model 90 Street Car and Model 91 Parlor Coach, operators find an impressive number of modern features. The advantages of each have been proved conclusively through hundreds of thousands of miles in actual service.

IN THE PARLOR COACH: Seats for 21-25 passengers. All, except auxiliary and rear section, are of the reclining type with 3-position adjustment and arm rests on both aisle and window sides . . . Interior baggage lofts are commodious and exceptionally sturdy . . . Interior appointments are finished in a distinctive modernistic motif.

FARGO
BUILT BY CHRYSLER MOTORS

IN THE STREET CAR: Seats for 21 passengers . . . Two large loading wells and 22-inch aisle (measured at seat cushions) that accommodate upwards of 40 standees in comfort . . . Two doors for rapid passenger circulation; each door 24 inches in clear.

IN BOTH COACHES, operators find an 8-cylinder, 120-horsepower engine that assures ample power and exceptional smoothness and pick-up . . . a rugged heavy-duty 4-speed transmission . . . an unusually short wheelbase—only 172 inches . . . 10¾-gallon cooling system . . . accessibility for engine adjustments and entire power plant quickly removable as a unit . . . full-floating rear axle of the worm-drive type . . . 10″ double-drop frame—outriggers lined up with cross-members to provide firm base for body . . . steering gear mounted ahead of front wheels . . . unusually short turning radius . . . 4-wheel, internal hydraulic brakes with booster . . . these and many other features whose advantages have been readily recognized by experienced operators everywhere.

FARGO MOTOR CORPORATION

DETROIT, MICHIGAN

DIVISION OF CHRYSLER CORPORATION

3,000,000 MILES *with* SILVERTOWN SECURITY

One of the Eastern Massachusetts Street Railway Company's rapidly growing fleet of Golden Arrow Motor Coaches.

Eastern Massachusetts Street Railway Standardizes on Goodrich

THREE million miles a year! Thru Boston's crowded streets...over good roads and bad...up steep hills and down.

Such service demands a tire that will stand the gaff. A tire that will deliver maximum mileage with a minimum of road delays. A *safe* tire. An easy riding tire. That's why the Eastern Massachusetts Street Railway chooses Silvertowns.

If you want increased riding comfort and safety for your buses—lower operating costs per tire mile—greater freedom from tire troubles, then you, too, should change over to Silvertowns.

Join the Silvertown Safety League

The Goodrich Rubber Company's nationwide campaign to reduce accidents through more careful driving has met with overwhelming response. Leading bus and taxicab operators have joined the Silvertown Safety League—are displaying the League Emblem.

Why not show your patrons that *you* stand on the side of safe driving? Enlist today. Pledges, lapel buttons and emblems for your drivers may be had without cost or obligation from your nearest Goodrich Distributor.

• • •

The B. F. Goodrich Rubber Co., Est. 1870, Akron, Ohio. Pacific Goodrich Rubber Co., Los Angeles, Calif. In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont. The International B. F. Goodrich Corporation (Export).

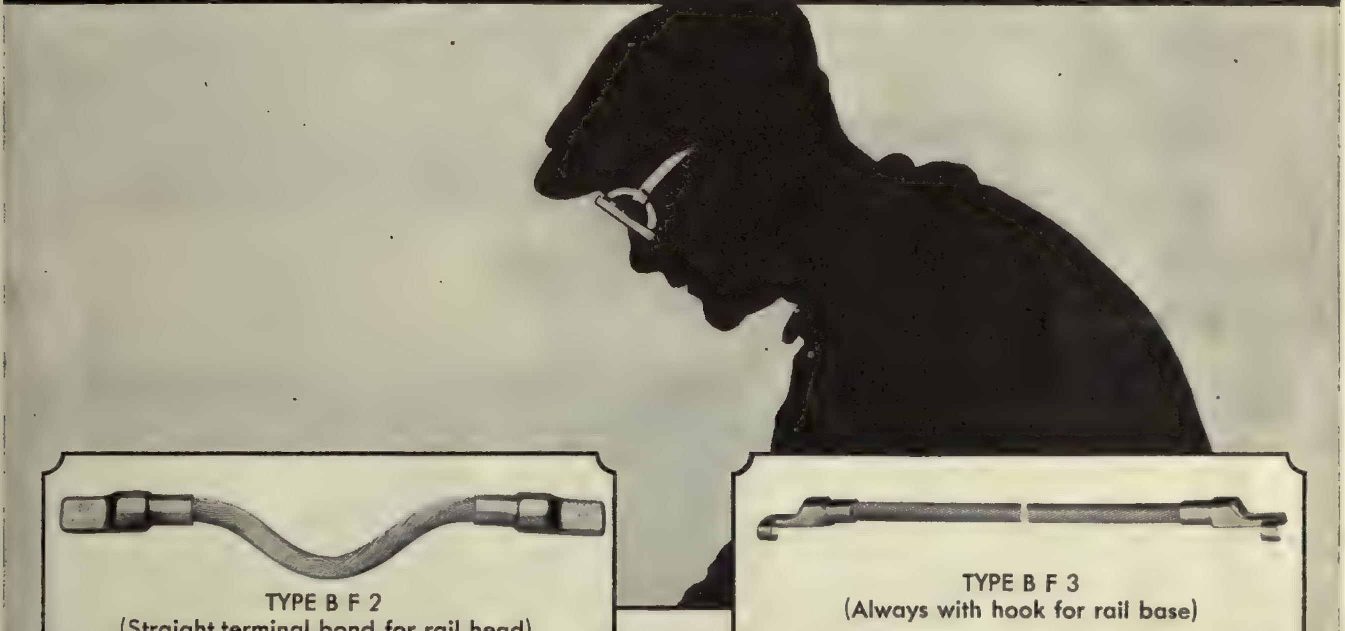
Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES

TIGER WELD
FLASH-BUTT-WELDED
POWER BONDS

THIS latest and most significant advance in power bond design assures welding simplicity and economy never before realized — as well as higher resistance to vibratory stresses. By newly developed manufacturing methods, the wires are intimately flash butt-welded to solid soft steel terminals, making it easy for any welder to give you better installations at lower cost. Five types — adaptable to flame or arc welding — each bond stretch-tested to insure positive unity. Full particulars and samples on request. Address the nearest office.

A TRIUMPH IN PERFORMANCE AND ECONOMY



TYPE B F 2
(Straight terminal bond for rail head)

TYPE B F 3
(Always with hook for rail base)

TYPE B F 1
(U bond for rail head)

TYPE B F 4
(Unformed straight terminal bond for rail base)

TYPE B F X
(Cross bond for rail base)

1831 COMMEMORATING AMERICAN STEEL & WIRE COMPANY 100 YEARS of PROGRESS IN WIRE MAKING 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION And All Principal Cities
Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

ROY W. HOWARD

Chairman of the Board
Scripps-Howard Newspapers

● "The twenty-five Scripps-Howard newspapers are members of the Audit Bureau of Circulations because of their high regard for the Bureau's integrity and efficiency. The A. B. C. has provided the advertiser and his agent with the yardstick for intelligent buying of advertising space. The almost all inclusive membership in the Bureau is a tribute to the high standards of honesty prevailing in the publishing business."

Roy W Howard

ADOLPH S. OCHS

Publisher
The New York Times

● "The ABC of circulation is good—essential—as far as it goes; but there are twenty-three more letters in the alphabet of advertising, and knowledge of their application is also essential for the intelligent use of A. B. C. reports. 'All is not gold that glisteneth.' A printing press and a sheet of paper are not all that is necessary to make a newspaper, nor is the number of circulated copies the only information necessary to measure the value of newspaper space."

Adolph S Ochs

AS one of the leaders in American journalism puts it, "—nor is the number of circulated copies the only information necessary to measure the value of newspaper space."

An A. B. C. report is full of other information quite as important to the advertiser as the number of copies of the publication distributed. Men whose business it is to buy space should read every page of an A. B. C. report, for therein they will find answers to every question an advertiser wants answered. Only thus can they judge whether or not the publication will meet the requirements demanded.

Advertisers, publishers and agencies are working to give the advertiser—for whom the service is planned—this only complete, accurate knowledge about a publication's circulation. The maintenance of the organization which makes these facts available is vital to every advertiser. To help support it costs each an insignificant sum as compared with what it saves each advertiser yearly.

Those publishers who have given freely verified circulation information should be encouraged to continue this most valuable contribution to advertising.

The advertisers in the United States and Canada, having profited by this action on the part of publishers, should give their support to the A. B. C. by becoming members and taking an active interest in its work.

Complete information regarding membership may be had upon request.

An advertisement by the
AUDIT BUREAU OF CIRCULATIONS
Executive Office · · · · Chicago

"Economy and Reliability"...

Are teammates in this ERICO Brazed Bond. The first cost of these bonds is low—in line with today's markets. Application is rapid—15 to 20 bonds per hour—means the minimum amount of labor for each joint bonded. Economy extends to maintenance too, for the left lay concentric stranding of the bond cable means the longest bond life.

Brazed bonding methods produce uniformly reliable results. The entire application can be watched without the use of dark glasses—each step of the application is under constant check. Yet despite this low heat of application, the large area of welded contact offers ample resistance to forces tending to loosen the terminal from the rail and provides a welded contact of the lowest resistance.

Electric Railway Improvement Co.

2070 East 61st Place, Cleveland, Ohio

For track areas

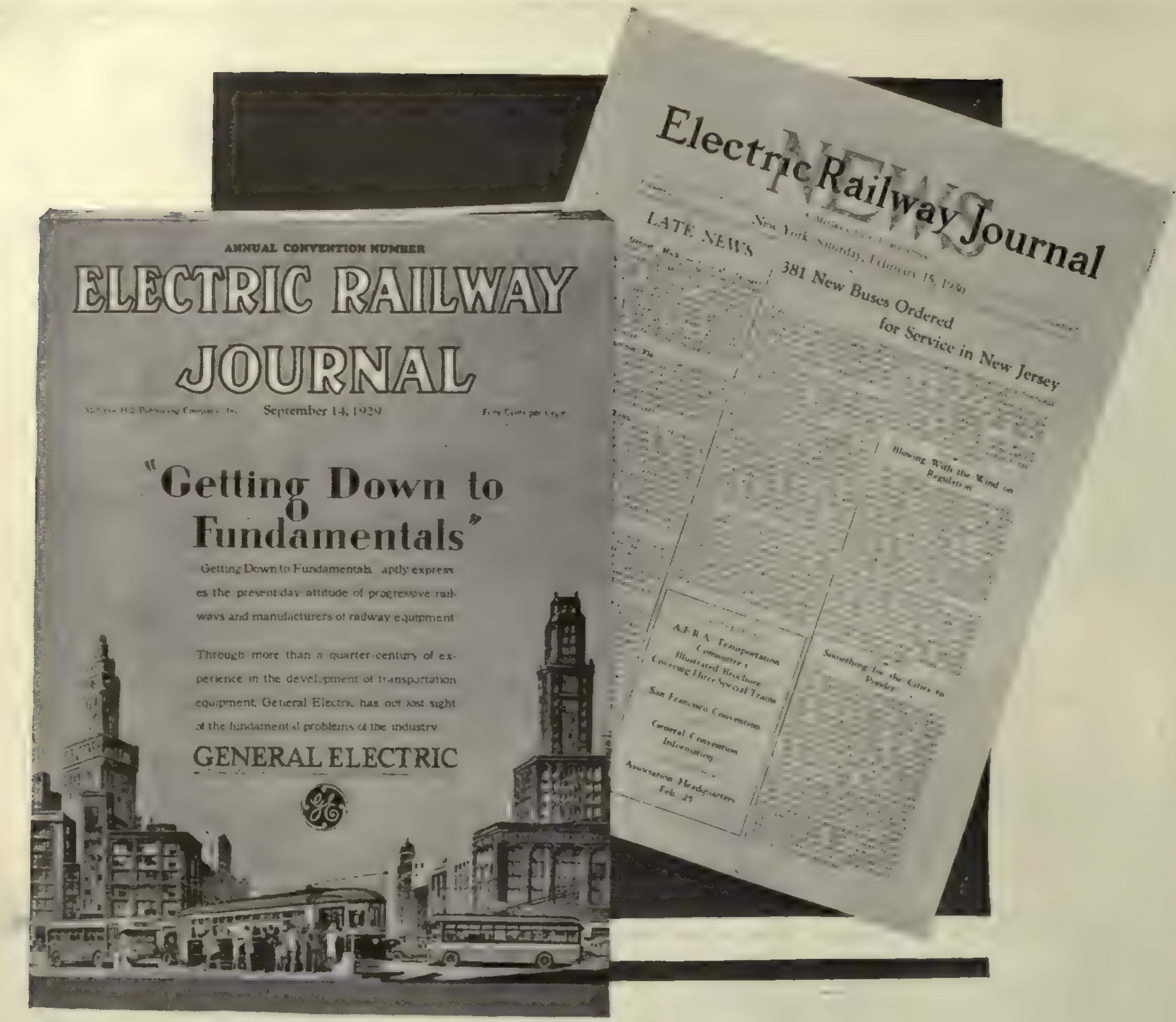
use

Brick Pavements

Improves your service and lowers your costs

Write National Paving Brick Manufacturers Association,

1245 National Press Building, Washington, D.C., for data.



ANNUAL CONVENTION NUMBER

ELECTRIC RAILWAY JOURNAL

September 14, 1929

"Getting Down to Fundamentals"

Getting Down to Fundamentals aptly expresses the present-day attitude of progressive railways and manufacturers of railway equipment

Through more than a quarter-century of experience in the development of transportation equipment General Electric has not lost sight of the fundamental problems of the industry

GENERAL ELECTRIC

Electric Railway Journal NEWS

New York, Saturday, February 15, 1930

LATE NEWS

381 New Buses Ordered for Service in New Jersey

Blowing With the Wind on Regulation

A.E.R.A. Transportation Committee Illustrated Brochure Covering Three Special Trains

San Francisco Convention

General Convention Information

Association Headquarters Feb. 25

Something for the Cities to Ponder

You need *both*—
The Journal *plus* The News

THE monthly edition of *Electric Railway Journal* gives you comprehensive articles on changing trends, technical advances and broad problems facing the industry.

And the E.R.J. *News*—the newspaper of the field—presents terse, accurate news dispatches of fare changes . . court decisions . . financial and corporate notes . . new legislation . . association meetings . . personal notes . . all the vital news of the industry.

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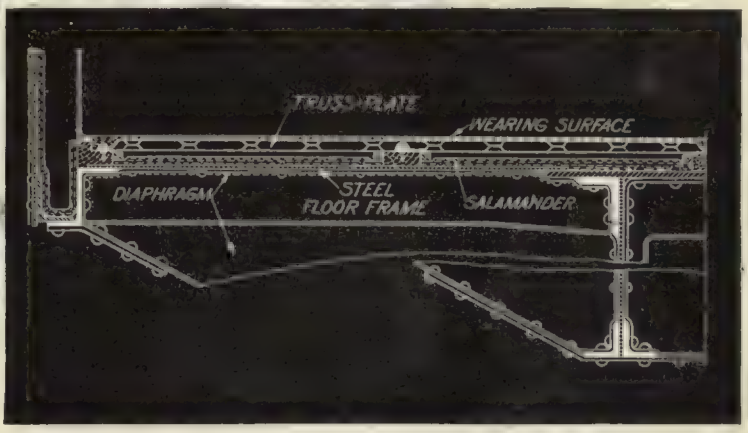

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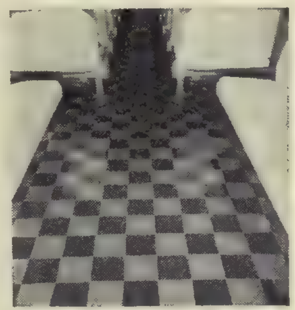

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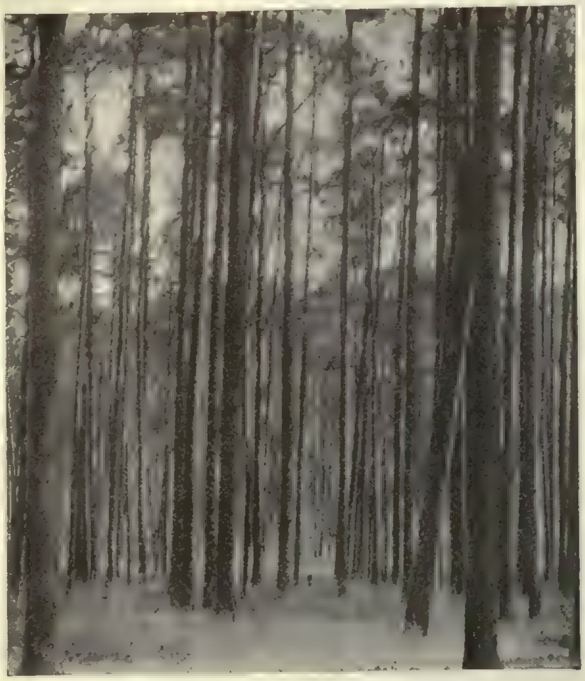

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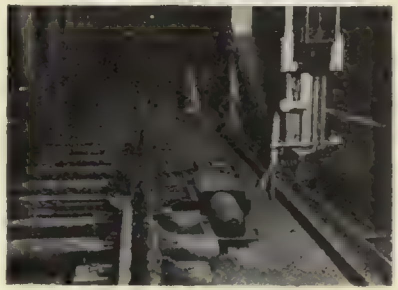

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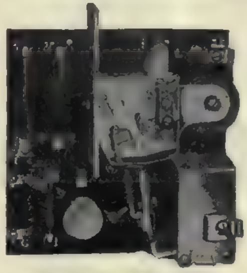

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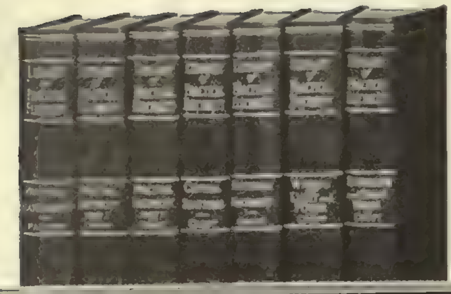

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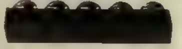

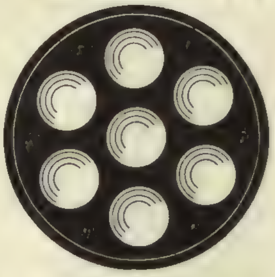

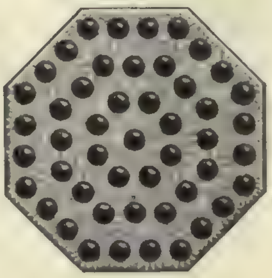

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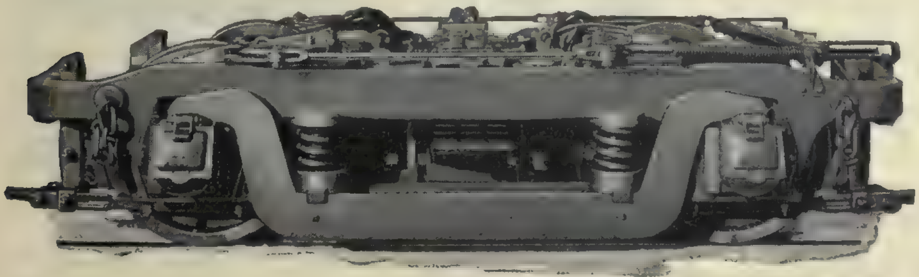

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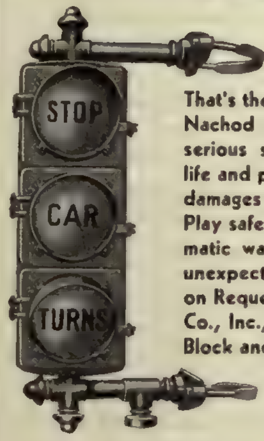

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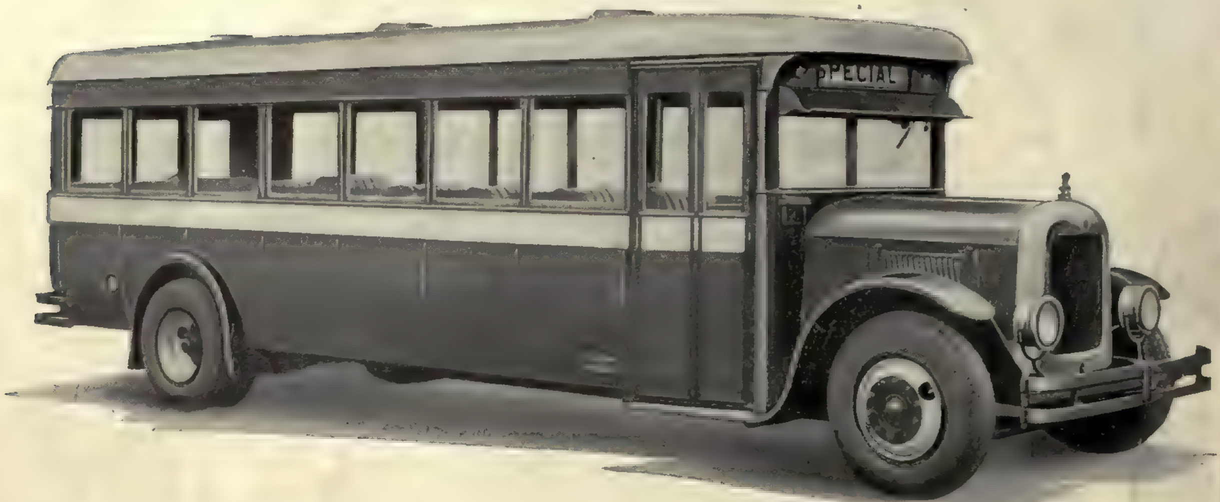

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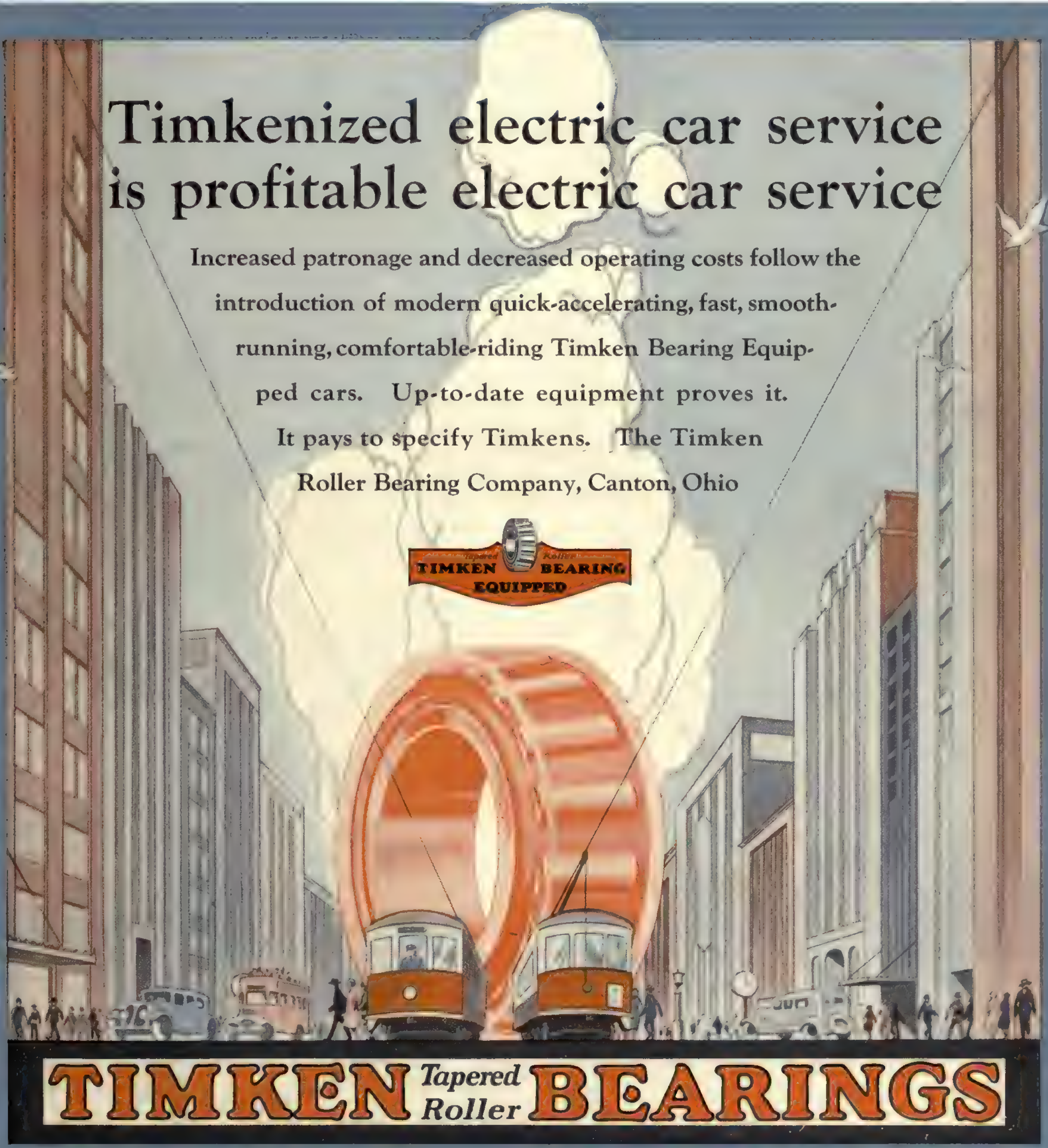
SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc. AUGUST, 1931 Thirty-five Cents per Copy



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Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

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Chicago
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W. C. Heston
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Alex McCallum
London, England

Vol. 75, No. 8 John A. Miller, Jr., *Editor* *Pages 393-444*

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Progress

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1931

Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérét local et de Transports Publics Automobiles.

New York *District Office, 285 Madison Avenue*
Washington, *National Press Building*
Chicago, *520 North Michigan Avenue*
Philadelphia, *1600 Arch Street*
Cleveland, *501 Guardian Building*
Boston, *1427 Statler Building*
Greenville, S. C., *1301 Woodside Building*
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St. Louis, *1556 Bell Telephone Building*
San Francisco, *883 Mission Street*
Los Angeles, *632 Chamber of Commerce Bldg.*
London, *Aldwych House, Aldwych, London, W.C.2*

Published monthly, with one additional Convention Number during the year. $3 per year, 35 cents per copy. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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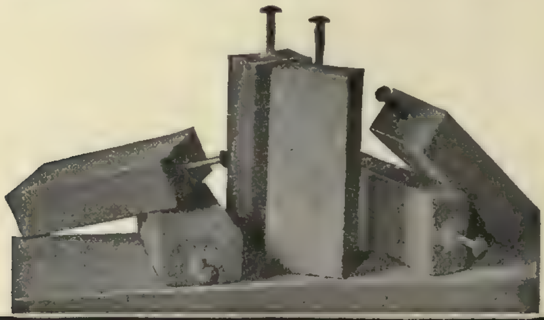

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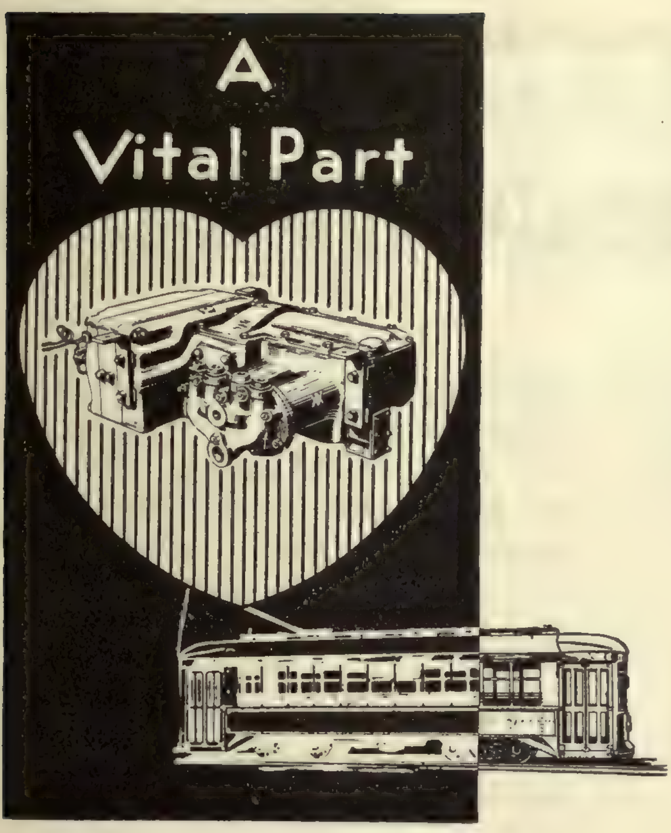

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BASED on average fares and earnings, an electric railway property earns one dollar from 200 passengers. Obviously, each dollar saved in maintenance costs equals the profits from 200 passengers.

Maintenance costs, both for labor and material, are most frequently reduced by buying ample material, but buying it on the basis of dollar-cost-per mile; dollar-cost-per thousand car passes; or dollar-cost-per-years of service.

A splendid illustration of this is found in the experience of a large eastern property. By adopting O-B Wheels as standard, they save $3,799 per year on wheel costs. In order to match these profits with passenger revenue, it would require hauling 759, 936 extra passengers.

Similar economies can be carried out in the discreet selection of line and track materials. Marathon Ears, for example, will reduce maintenance costs of ears because of their tapered, bumpless ends. Or O-B Bonds, because of their durability and high conductivity, will lower the cost of maintaining the track return circuit.

Thus, properties which are finding it difficult to adequately increase their car riders are, to some extent, offsetting the additional revenue problem by reducing the cost of maintenance. And at such times, they find it desirable to turn their attention to O-B products.

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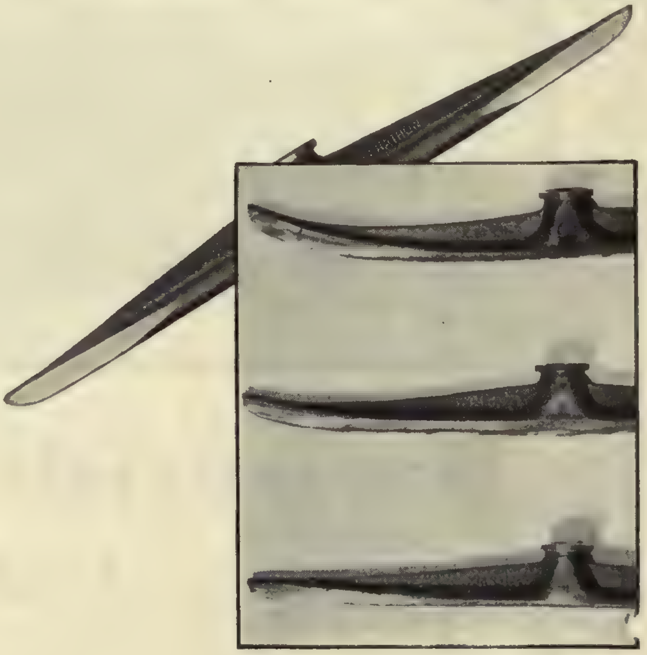
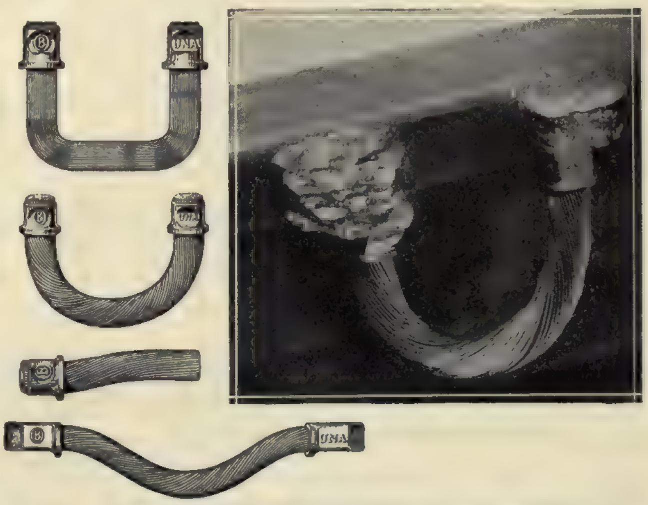


Here is proof of the extra life value of the tapered end. Three Marathon Ears removed from service on three different properties show a negligible amount of wear on the tapered portions. This indicates that the ends hold without curling even after the center section is worn out. It further demonstrates the elimination of wheel bumping and arcing as it enters and leaves the ear.



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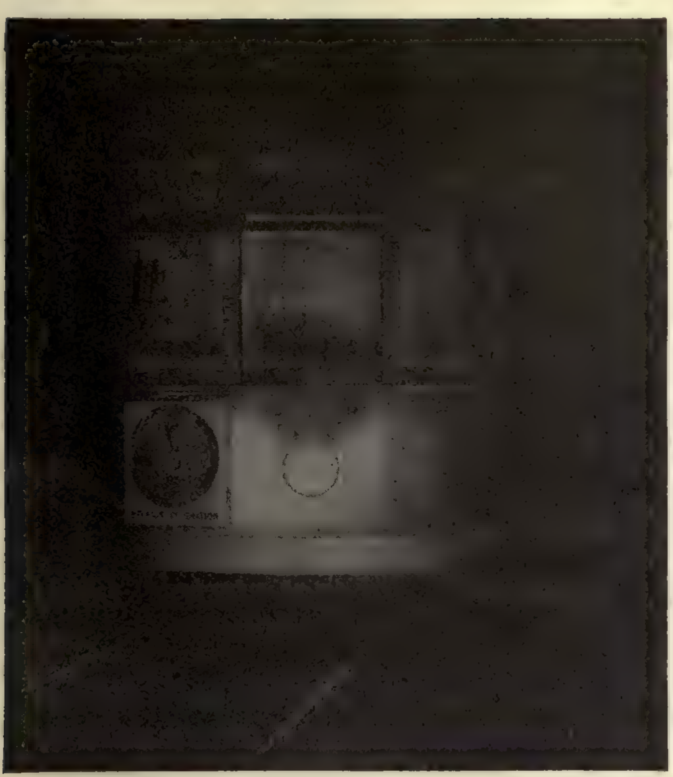

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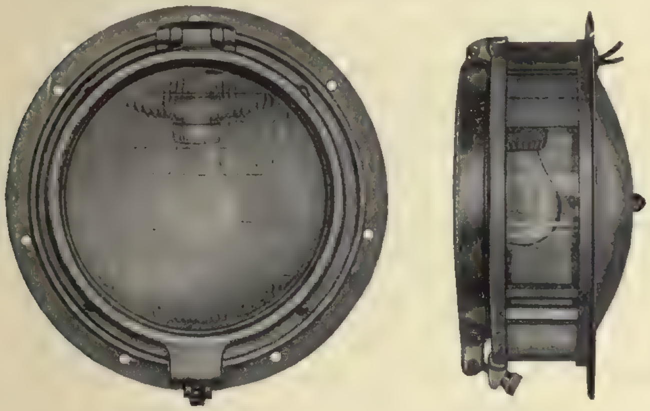

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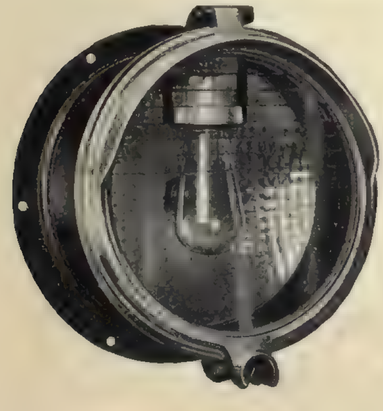

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SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

390-73

GENERAL ELECTRIC

TRANSPORTATION EQUIPMENT

ELECTRIC RAILWAY
JOURNAL

New York,
August, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Volume 75
Number 8

JOHN A. MILLER, JR., *Editor*

Bringing Order Out of Chaos

LOCAL transportation is a community problem. The Massachusetts public control act recognizes it as such. The Cleveland and other similar service-at-cost grants recognize it as such. The efforts to effect co-ordination in London and New York recognize it as such. And the recent Chicago settlement recognizes it as such. These should be harbingers of a better day, not only for those who perform the public function of supplying transportation—but for the public itself.

But even where the responsibility has thus been recognized it has not been assumed by the local authorities to the extent it should have been. Order will never be brought out of chaos in local transportation until there is better planning. That is not to say that the local transportation industry has not done its part. It has done the best it could, but the problem has become too complex to be solved by the industry alone. Before further progress can be made, there must be more general recognition by the local civic and political bodies of their responsibility to the public and to the agencies that furnish local transportation.

In the early days, this industry, of itself, rose to meet the needs of the situation. After the orgy of competitive building which is always concomitant with an industry during the promotional stage, the era of consolidation set in as a matter of self-preservation. Weak systems were eliminated or nurtured until they became strong. The problem now is to preserve the existing systems and to turn them to the greatest public advantage under public safeguard and supervision. There can be no doubt that organized transportation agencies, regulated by public bodies, will continue to transport the vast majority of people in all communities of fair size, but the great need is for civic recognition of the fact that rapid transit trains, trolleys, buses, and taxicabs must be co-ordinated to better advantage.

Certainly, civic consciousness is lacking in courage that charges an industry with responsibility and then does not play its full part. There is little planning in the civic sense in an order of things that calmly contemplates the problem of the parked car, permits unlimited use of the streets by taxis and countenances competition by other forms of carriers that is ruinous, sanctions imposts of paving taxes and other obligations both onerous and archaic and does not take the question of local transportation fully into consideration as a factor in city planning.

In recent times this industry, by and large, has improved service, avoided politics and been frank with the public. But its remarkable technical progress has been largely negatived in the cauldron of conflicting political and personal ambitions. There have been a few isolated instances, such as those cited, where consideration of the transportation needs of the community has risen above political truckling, but real order will not be brought out of chaos until the instances have been multiplied many fold.

Waste in industry—in any industry—is a crime against society. Too often waste has been imposed on this industry in the form of duplication of facilities—imposed as a result of political pettifogging on the part of those charged with responsibility to the public. The saying is just as true now as it was when first uttered that small minds and a great empire go ill together. And it is the small minds of men in public life that have prevented the local transportation industry in most places from reaching the stature of a great empire—its proper destiny.

Scientific Fare Study Needed

NEED for increased revenue to meet the greater costs of operation that became apparent almost as soon as the World War started in 1914 has been back of the rate increases that have been practically universal on transportation systems of all kinds in recent years. On both steam and electric lines passenger fares have been revised upward with widely differing results. On the steam railroads, with a flat advance and the elimination of various special classes of fares, the riding has fallen off so greatly that, in many instances, the gross passenger revenue is less than it was before the war. Of the street railway systems which have increased rates, some show revenues of more than twice as much as they were at the end of the war, while others with fare increases as great or greater show an actual loss in revenue. Certain properties on which the 5-cent fare has been retained show a decided gain in business. Detailed results in nineteen cities are given by John A. Beeler elsewhere in this issue.

Care must be taken in interpreting the results in the various cities. Changes have occurred in the population served, first by actual growth in the same area, second, by addition of new routes, and third by annexations of territory. But even after making allowances for these differences, the discrepancies in results obtained with similar fare revisions are so great that it is evident that other factors than the fare itself have a tremendously important bearing on the situation.

At one time it was generally thought that the determination of the revenue that would be obtained with a given rate of fare required no more than a simple mathematical calculation. If that ever was true, it is true no longer. Every day electric railway operators are coming to realize this more clearly. To determine in advance the probable effect of a change in fares a thorough scientific analysis of all related factors is absolutely essential.

Hidden Sources of Income

WHEN a railway management is straining every nerve to make ends meet, a few thousand dollars more in the net income may be of vital importance. After all the thought that has been devoted to the subject of economy, it would seem that no stone could have been left unturned that would cover a chance to make a saving in operating expense. Yet in almost every company there are hidden possibilities. Sometimes things that should be obvious continue to be overlooked because the situation is accepted as a matter of course and changes are not given a thought. Perhaps after an investigation a minor economy is effected, when a more searching analysis might have shown a still greater saving by the use of a better method. Often an improvement made only a few years ago, excellent though it was when adopted, has become obsolete, and a further adjustment should be made at once to meet the conditions of today.

Not only in major items should account be taken of such possibilities for reduction of costs. What appear to be small items soon mount up to large totals. As an example, an opportunity for saving that easily may be, and often is, overlooked, is in the use of fuel for incidental purposes about a railway property. Carhouses, shops, and miscellaneous buildings must be heated, and there are various uses for fuel in larger or smaller amounts. On the average property, plants of different types have been installed at different periods, and a variety of fuels must be purchased and distributed. Illustrating what one company can do, the Montreal Tramways, through an analysis made by a consulting fuel engineer, last winter was able to cut 27 per cent from a fuel bill of $55,241. The economies will be carried still farther next winter as the result of other changes, so that the total saving will be about $22,000. Beside these savings in miscellaneous uses, a standby steam power plant has been rearranged to burn oil, cutting the fuel cost from $17,000 to $6,000. The savings were made with practically no capital expenditure, and were due either to better choice of fuel or better instruction as to methods of firing.

Similar opportunities undoubtedly exist on other properties. No saving is too small to be worth while. The cumulative total of numerous minor economies cannot fail to affect the annual operating statement favorably.

The Car Is the Key to the Problem

ANY analysis of the present situation of the street railway industry leads inevitably to the conclusion that there must be substantial improvement in the type of rolling stock operated. No one can deny that a considerable portion of the cars now used in passenger service are obsolete in design, noisy, expensive to operate and to maintain, and utterly without rider appeal. Because the majority of them were built to special order in small lots, their first cost was comparatively high and their carrying charges are a continuing burden. The car unquestionably is the key to the problem of increasing traffic and reducing expenses.

That a group of leading operators, car builders and equipment manufacturers have formed a voluntary association to develop a car or cars which will overcome these various objections is a matter of the greatest significance to the entire industry. The Electric Railway Presidents' Conference Committee is such an association. Organized last September in a time of business depression and uncertainty, it has encountered some delays in getting its program under way. The major preliminary difficulties have now been disposed of, however, and the committee's engineers are fairly launched upon the task which has been assigned to them.

It goes without saying that this task is no easy one. Many of the inherent ideas of both the car builders and operators may have to be scrapped in the process of developing a unit which will adequately meet present-day requirements. Comfort, appearance, riding qualities, noise reduction, lighting, ventilation, and all the prejudices and preferences of a critical public, must be taken into consideration. Faster acceleration, faster braking, reduction in weight and in energy consumption, are some of the objectives sought. Withal, there must be no compromise with safety, and due regard must be had for existing and probable legislative enactments affecting design and operation.

The committee is under no illusions as to the speed with which the task may be accomplished. Progress involving the process of trial and error and patient investigation, must necessarily be slow. But speed is not so necessary as thoroughness, and the industry will be content to await the result with the assurance that accomplishment, when achieved, will be worth while. A "first model," as called for in the committee's plans, will in all probability embody no more than the best of present design and apparatus. Subsequent models are expected to include the results of research into new fields.

In the meantime, the industry must not stand still, nor should orders for rolling stock be held up pending the committee's conclusions. The last word in car design will never be spoken, nor will perfection be attained either by this generation or the next. Consequently, the prospective purchaser of rolling stock, who has carefully studied his own requirements and who is guided by the best of present practices in the choice of materials, equipment and design, may place his order in all confidence that he will get a vehicle far better than those of a few years ago and one that will compare well with any likely to be developed in the near future.

▼

Be Sure that Renewal Parts Manufacture Pays

CIRCUMSTANCES sometimes appear to favor the manufacture of certain simple kinds of renewal parts by the electric railways. With shops, tools and a skilled maintenance personnel available, it is easy to build up a department for the manufacture of renewal parts. But the danger lies in the tendency to keep the department busy regardless of whether the added work can be justified economically. Especially is this true at a time like the present when the railways are faced with the problem of cutting their maintenance force because of a sharp drop in riding. To wish to hold as many men on the payroll as possible by shifting them from regular maintenance to the manufacture of parts is praiseworthy. But to assume that the home-made parts are cheaper than the marketed products, without having accurate cost records, is a dangerous error.

Sometimes railways produce cost records showing that they are making parts at costs that are well below the prices of the manufacturers. Such records are almost invariably incomplete. An investigation of one company disclosed that the cost of parts was arrived at without including direct overhead charges, such as superintendence, insurance and rentals, that amounted to 48 per cent on labor and 20 per cent on materials. This error is a common one because the railways have no regular accounts for manufacturing work. Manufacturers of renewal parts, on the other hand, must determine their costs accurately, or else they will find themselves doing this business at a loss.

Since the railway need not include selling expenses or profits in the final cost, possibly under a set of favorable circumstances it can manufacture parts cheaper than it can buy them. In view of the highly efficient methods employed by large manufacturers, however, it is open to serious question whether many of them really do so. Quality and service considered, it usually is better to leave the production of parts to concerns that make a specialty of manufacturing.

The New Declaration of Independence

JUST prior to July 4 readers of one of America's most widely circulated dailies were urged to sign a new declaration of independence—to declare themselves "independent of train, buses, subways and street cars." And they were to do this by buying good, used cars, selling right now at the lowest cost in automotive history.

The happy possessor of one of these vehicles was assured he would have no time-tables or schedules to annoy him; that he would be master of his own transportation problem. There were pictures of a man who had missed his train, a bus in which there was no more room, a subway jam and a trolley crush. To cap the climax there was a picture of a runabout with a man at the wheel who simulated the appearance of an auto racer.

Of course, subway jams are not unknown; neither are trolleys in which there is a crush, or buses in which there is no room. But the picture of rolling one's own—a second-hand one, at that—intended to portray the happiness of the man who had declared himself independent of trains, buses, subways, street cars—that was the work of an imaginative artist.

Those who do roll their own know that there is no such ease in driving as this advertisement sought to convey, except in the most remote regions. Wisdom will come quickly to the man who hopes to declare himself independent of trains, buses, subways, street cars, by buying an automobile, particularly "a good used car." Under some circumstances, the auto may be a badge of independence, but as a substitute for mass transportation, it will prove a snare and a delusion.

▼

Decorating Cars with Good Intentions

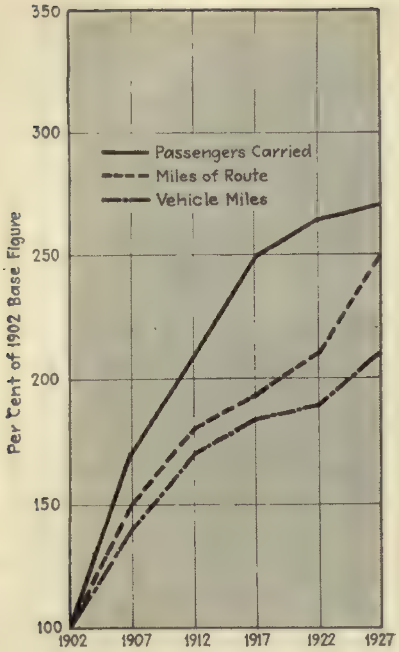
REALIZING the value of attractive appearance, many railways have been active of late in repainting and in redecorating their rolling stock. Sometimes, however, their zeal has outrun their discretion. This is particularly true concerning the decoration of car interiors. The outside painting scheme of cars is usually fairly well standardized on each property, and changes are made only after careful consideration. But the scheme of interior decoration often is left to the judgment of the shop foreman or master mechanic, and the results thus obtained sometimes have been sadly lacking in artistic effect. Decorating the interior of a street car does not, of course, demand the same degree of artistic skill as decorating the drawing-room of a millionaire's mansion, but it does require some knowledge of color values and how to employ them. If it is worth while to redecorate car interiors at all, it is worth while to do it well. Moreover, it costs no more to make effective use of paint than to use it ineffectively.

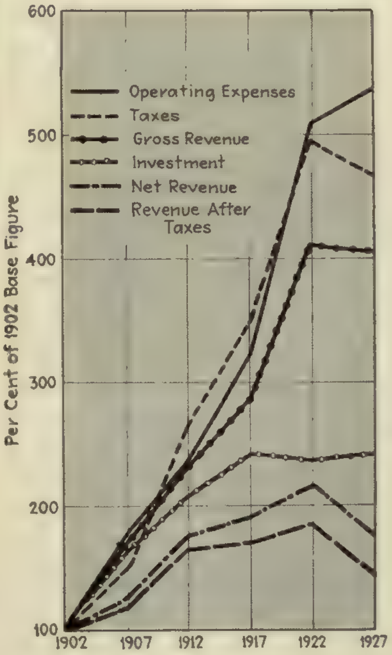
MASS TRANSPORTATION

By

Francis H. Sisson

Vice-President Guaranty Trust Company
New York, N. Y.





Mass transportation service has continued to show a steady growth despite the increased use of private transportation, but the financial returns in recent years have been far from satisfactory

ADEQUATE mass transportation service is a vital necessity to business and industry in every city. It is no less essential to community life under present-day conditions than is gas and electric service. Yet the electric railways of the United States stand out in sharp contrast to the other public utilities in that for many years their operations have been for the most part unprofitable. This branch of the public utility industry, taken as a unit, earned a total net income in 1927, after payment of taxes, equal to only 3.1 per cent of its property investment, according to the latest United States Census of Electric Railways. In many individual cases, the income remaining after payment of operating expenses, taxes and fixed charges is practically negligible. On account of the inability to earn a reasonable return on the capital invested it is extremely difficult for the companies to finance improvements and the maintenance of a high standard of service is manifestly impossible.

This situation is set forth in detail in an accompanying table, which shows the financial results of electric railway operation at five-year intervals since 1902, as reported by the Census Bureau. Although figures could be estimated for years subsequent to 1927, on account of the different derivation they would not be strictly comparable with those shown. Moreover, conditions during the past two years have been affected by the general business depression, and, to that extent, are not significant in connection with the long-term trend. The same figures are shown graphically in two charts, in which the various totals have been reduced to percentages of the 1902 levels for comparative purposes.

The first chart shows a steady increase in passengers carried, miles of route served, and vehicle-miles operated. It is especially significant that, despite the enormous development of the private automobile, the business of furnishing mass transportation in cities and towns has shown this constant growth throughout the 25-year period covered. The continuous upward movement of all the curves on the chart furnishes striking evidence of the essential character of community transportation service.

Detailed figures covering different classifications of traffic show even more clearly the importance of mass transportation today. Where there has been a slight downward trend in the total number of passengers carried, the loss has been principally in off-peak, Sunday, holiday, and pleasure riders. Rush-hour traffic has tended to increase. This has created a serious problem for the operating companies, but the growth in rush-hour traffic establishes them more firmly than ever as essential elements in urban life.

Taking Boston as an example, we find that the total number of passengers carried by the Boston Elevated Railway in 1930 was slightly smaller than in 1920, but that the number of passengers carried between 5 and 6 p.m. on an average week day was 133,235 in 1930, as compared with 124,761 in 1920. This gain shows clearly the increased importance of the service at the most critical period of the day. In Chicago, the number of passengers carried daily by the surface lines is greater than the number of telephone calls. The total number of passengers for the industry as a whole is greater than the number of postage stamps sold in this country.

The second chart shows the increases and decreases from 1902 to 1927 in operating expenses, taxes, gross revenue, total investment, net revenue, and income available for interest and dividends. It will be noted that

Must Be Placed on a Firm Financial Basis

Francis H. Sisson

With a background of experience in journalism, advertising, utility management and banking, Francis H. Sisson is in a position to understand thoroughly the difficult problem of furnishing mass transportation. He is a graduate of Knox College and Harvard University. After spending some years as reporter, editorial writer, and editor of a daily newspaper at Galesburg, Ill., he joined the staff of *McClure's Magazine,* New York. Thereafter he devoted his attention for a time to advertising work. From 1916 to 1918 he was assistant chairman of the Association of American Railway Executives. Since then he has held the post of vice-president of the Guaranty Trust Company of New York. In this article he draws upon his broad experience to suggest possible means of placing essential mass transportation on a sound financial basis.

operating expenses and taxes have increased much more rapidly than gross revenue. The net revenue showed a moderate increase until 1922, as did the income available for interest and dividends. Since then, both have declined sharply. In connection with taxes, it should be noted that various imposts, such as paving charges, etc., which are of the nature of taxes, are included under operating expenses, rather than directly under taxes. It might also be mentioned that by far the largest element in operating expenses is wages, which have been greatly increased.

No single factor can be pointed out as the main reason why electric railways have failed to earn adequate returns in recent years. In some instances, street car lines were constructed as a result of civic pride and ambition, rather than in response to any real need for new transportation systems, and were therefore doomed to failure from the start. A large proportion of the bankruptcies, forfeited charters, and abandoned rights-of-way have been reported in small cities and towns, suggesting that the average rates of return for the industry as a whole have been consistently pulled downward by the unsatisfactory results achieved by companies that never should have been organized in the first place. In other instances, trouble has been wholly or partly due to incompetent management.

Such conditions, however, are evident only in isolated cases and fail to explain the almost uniform lack of satisfactory earnings by the country's mass transportation agencies. The low rates of return that have been shown with increasing regularity during recent years are probably due, for the most part, to two factors: (1) higher costs due to the rise in prices and wages, combined with the difficulty of obtaining commensurate advances in fares, and (2) increasing competition due to the swift growth of automotive transportation.

The problems thus created have been the more perplexing by reason of the fact that the remedy commonly adopted by industrial concerns confronted with a depressed market—namely, curtailment of operations—is not available to the electric railways. The first reason for this is that the investment in plant is so large that curtailed operations fail to earn its carrying charges. The second reason is that operating schedules, like rates, are a matter of contract between the companies and the municipalities or are otherwise subject to review by public regulatory bodies, so that, even if curtailment of operations were economically possible, it would not be permitted.

There can be no doubt that one very important cause of the difficulties of electric railway companies has been the oppressive and arbitrary treatment they have often received at the hands of public officials. The railways, being protected monopolies, are subject to regulation "in the public interest." In its historical application to the specific problems of electric railway management, this supposed "public interest" has often taken the form of a demand for cheap and efficient transportation, regardless of financial returns to the companies.

In so far as the difficulties of electric railway companies are due to competing forms of transportation, it appears that the private automobile has been the most important factor. Bus transportation is, of course, in a sense, a more direct form of competition; and there can be no doubt that the use of buses has profoundly affected the development of mass transportation in this country in the last decade. In a few localities, the buses have virtually supplanted the electric cars. More often, however, it has happened that the two agencies have operated together, either in competition or in a mutually supplementary relationship. In many instances the buses themselves are operated by the electric railway companies, although sometimes the union has been effected only after a period of severe competition that has almost ruined either or both of the rival systems. As far as can be seen at present, it appears unlikely that either form of transportation will entirely displace the other. In crowded districts, where street space is at a premium, the electric car will probably remain indefinitely as the backbone of the transportation system.

It is generally agreed that the principal cause of the loss of traffic has been the private automobile. In general, the traffic diverted in this way has been non-necessity traffic. While its loss has created a serious problem for the operating companies, it has not lessened the essential importance of mass transportation service in the economic life of the community.

In this situation the general attitude of business men and the public at large has been one of indifference. The most influential people in the community are probably those who use mass transportation service the least. Another large element in a community clings to the idea that, because some electric railways made large profits in bygone days, the industry must still be making them, and that pleas for relief are only thinly disguised efforts to fatten the already bulging pockets of the stockholders.

The companies have tried in many ways to improve their financial position, with only indifferent success. The most obvious remedy, of course, was to seek higher fares. Two powerful factors have operated against the success of these efforts. The first, as has been pointed out, is the powerful political opposition that has usually developed among property owners, passengers and demagogic politicians. The second is that higher fares often fail to bring about the expected increase in gross revenue. In many communities, there is apparently a fairly large body of marginal passengers who either do less traveling or adopt other means of transportation when the fare is increased. These two factors combined have prevented the average rate of fare from increasing in anything like a corresponding proportion to the advance in cost of operation.

In some cities, relief has apparently been found in the so-called indeterminate franchise providing for service at cost—with, of course, a reasonable rate of return to investors included as a part of the cost. This plan partly relieves the service of the danger of political interference and assures the public of transportation rates representing the approximate cost of the service. At the same time, by assuring the company of an opportunity to earn a reasonable return, it encourages the investment of new capital and facilitates improvements and extensions of service. While the plan is subject to the criticism that it provides something in the nature of a guaranteed return, and may, therefore, be held to remove the incentive to efficient operation, it appears that this difficulty has not yet been encountered where the system has been tried. One reason for this probably is that the fear of a loss of traffic in case the fare becomes too high provides a strong inducement for the company to endeavor to operate profitably with as low rates as possible.

In so far as management has been able to accomplish it, operating expenses have been reduced. There are, however, many elements of expense of questionable justification over which the railways have little or no control. In some instances, the companies are compelled to pay the salaries of traffic policemen stationed on the streets where they operate. In other instances, the railways contribute substantial amounts to the upkeep of the public parks. Almost everywhere, they pay large sums for the installation and maintenance of paving that is used only by others. Income and gross receipt taxes are assessed in varying amounts. It is estimated that imposts of these kinds take, in some cases, more than 60 per cent of the net revenue of the companies.

Viewed in the large, the operation of electric railways, like that of many other public works, involves a combination of economic and social interests that frequently come into conflict. In some respects the situation is similar to that which has frequently been encountered in connection with the administration of highways. Privately owned toll roads have almost completely disappeared, because it has been found that the public interest is best served by a socialized method of operation—that is, by a free use of the roads and by the payment of construction and maintenance expenses by taxation. In principle, the same method might be regarded as ideal in electric railway administration. But the latter is so enormously more complex than highway maintenance, and the managerial capacity of governmental bodies has so frequently been found inadequate to cope with even the relatively simple problems presented by the administration of the highways, that public opinion has almost invariably rejected the idea of governmental operation of utilities.

The best solution of the problem, like its causes, will probably be found to vary with local conditions. One course that would seem to offer great possibilities is to place the real situation squarely before the public and to make business men think about it. The transportation companies have been trying to do this, but their efforts have often been regarded as insincere. Few leaders of business and industry and few organs of public opinion have interested themselves in this tremendously important problem.

A second step would seem to be to relieve the transportation companies of their present unreasonable burdens and reduce to the lowest practicable point the taxes they have to pay. This will mean that compensating increases in taxes must be secured from some other source. Opposition to such a plan, however, should not be insurmountable if the public thoroughly understands the situation.

A third step that has been suggested is that of assessing benefited property for a part of the original cost of transportation facilities, as is done for such other public services as water mains, sewers and pavements. By this means, the capital investment upon which the transportation company must earn a return would be substantially reduced.

More radical suggestions have sometimes been advanced. A combination of private ownership and public operation has been tried in a few cases. This method, however, appears to expose the carriers to the dangers of both public and private control, without fully realizing the benefits of either.

The opposite possibility—that of public ownership and private operation—has been suggested as a possible means of combining the advantages of socialization and operating efficiency. It is maintained that this system would offer possibilities of economy, first, in the use of capital at low interest rates; and, second, in the incentive to private gain on the part of the management. Presumably the enterprise would be entirely owned by the city or state, which would employ expert managers to operate the system on some sort of profit-sharing basis. The rates would be fixed; profits would be divided between the municipality and the managers; and deficits would be met from the public treasury. In this way, a partial separation would be effected between revenue and expenses, and there would be no opportunity for demagogic appeals to the detriment of the legitimate interests of owners of the enterprise. In one respect, the incentive to efficiency might be even stronger than under ordinary private ownership, since the gains from economical management would accrue directly to the managers responsible for those gains, instead of to a large and partially inert body of stockholders more or less ignorant of the problems of management.

Summary of Electric Railway Operations, 1902-1927

(*Including affiliated bus operations* 1922 *and* 1927)

	1902	1907	1912	1917	1922	1927
Passengers carried	5,837,000,000	9,837,000,000	12,135,000,000	14,507,000,000	15,395,000,000	15,776,000,000(*a*)
Vehicle-miles	1,144,000,000	1,618,000,000	1,922,000,000	2,140,000,000	2,153,000,000	2,437,000,000(*a*)
Route-mileage	16,645	25,541	30,438	32,548	34,004	42,247
Investment	$2,308,000,000	$3,779,000,000	$4,715,000,000	$5,532,000,000	$5,459,000,000(*b*)	$5,517,000,000(*b*)
Gross revenue	$247,554,000	$418,188,000	$567,512,000	$709,825,000	$1,023,719,000	$995,895,000(*a*)
Operating expense	$142,313,000	$251,309,000	$332,896,000	$452,594,000	$734,495,000	$760,231,000
Net revenue	$135,241,000	$166,879,000	$234,615,000	$257,230,000	$289,224,000	$235,662,000
Taxes	$13,079,000	$19,756,000	$35,028,000	$45,757,000	$64,988,000	$60,689,000(*b*)
Ratio of taxes to net revenue	9.7 per cent	11.9 per cent	14.9 per cent	17.8 per cent	22.5 per cent	25.8 per cent
Revenue after taxes	$122,162,000	$147,123,000	$199,587,000	$211,473,000	$244,236,000	$174,973,000
Rate of return	5.3 per cent	3.9 per cent	4.2 per cent	3.8 per cent	4.1 per cent	3.1 per cent

(*a*) 1927 shows an increase in passengers carried and vehicle-miles operated, while the gross revenue has declined. This is probably due to the use of co-ordinated bus service by passengers who get free transfers, or transfers for less than full rate of fare.

(*b*) 1922 and 1927 show decreases in investment due probably to abandonment of unprofitable rail lines. While they have been replaced to some extent by buses, and bus extensions have also made in new territory, the added investment has been less than that of the abandoned rail property. This is reflected in slightly lower taxes in 1927.

On the other hand, the system would undoubtedly be found subject to some of the weaknesses inherent both in public and private administration. The large amounts of capital subject to the control of public officials, and the correspondingly large potential gains, would offer very strong temptations to fraudulent practices—not only in the form of collusion between officials and utility managers, but through unsound business policies on the part of the management designed to show unduly large earnings, with swollen profits for the administrators. Moreover, it is likely that large individual earnings resulting from exceptional efficiency would, as under the present system, raise the cry of profiteering. But it is not certain that any of these weaknesses would be more pronounced than under the now general system of private operation and ownership under public regulation.

These and other suggestions that have been made are, for the most part, either makeshift devices that fail to strike at the economic conditions lying at the root of the problem, or methods so drastic in their nature and so uncertain in their effects that they would not be resorted to unless the situation should become truly desperate. It should not be necessary to look so far afield for an equitable solution. In communities where the electric railways are really essential, intelligent cooperation between public officials and company managers should be able to place the utilities on a self-supporting basis. Where they are not, it is as well to face the fact that no conceivable set of operating conditions could enable the companies to make money.

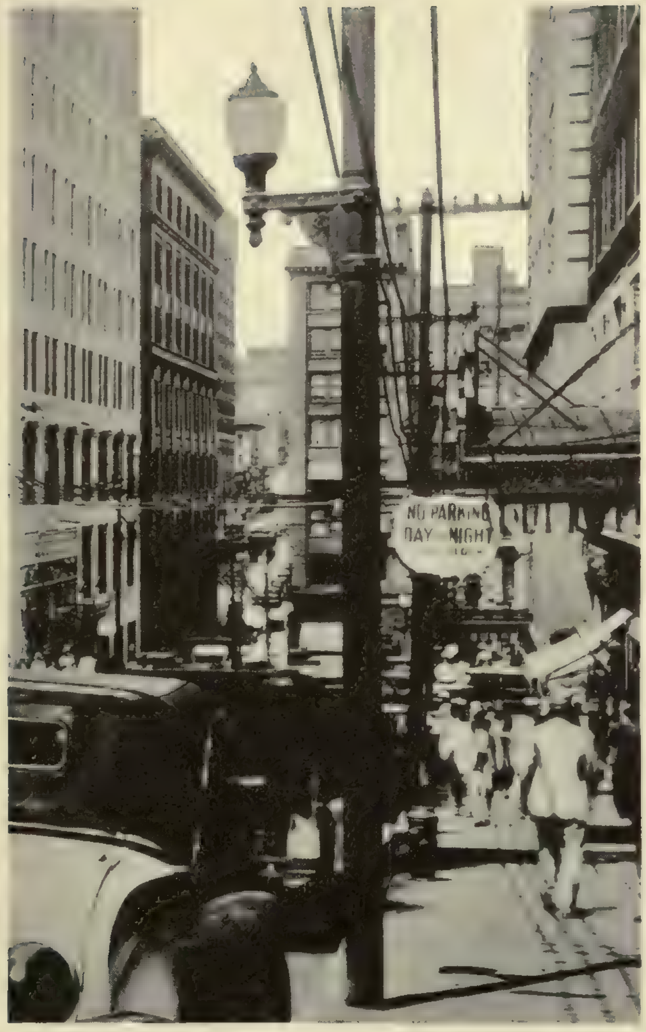
Some light may be thrown on the problem by an examination of the rates of fare and the rates of return shown in the accompanying table. In 1902, with an average fare per passenger of 4.24 cents, the industry earned a return of 5.3 per cent on its total property investment. In 1922, with an average fare of 6.65 cents, the rate of return was 4.1 per cent. In 1927, the average fare was 6.31 cents and the rate of return 3.1 per cent. If the average fare in 1927 had been 7.06 cents and the number of passengers had remained the same, the return would have been 5.3 per cent, the same as in 1902 (under the not quite valid assumption that taxes would have remained the same). In other words, an increase of three-quarters of a cent in the average fare would have increased the rate of return from 3.1 to 5.3 per cent. Such an increase would surely not impose a heavy burden on passengers, nor should it divert a very large volume of essential traffic.

The weakness of an analysis of this sort, of course, lies in the fact that it treats the industry as a homogeneous unit, instead of a combination of many individual units operating under widely differing sets of conditions. In many localities, no doubt, the utilities face a competitive situation where any increase in rates sufficient to place them on a self-supporting basis would defeat its own purpose by causing many passengers to use other forms of transportation. Elsewhere, however, a fairer attitude on the part of the public in the matter of rates and taxes would place the companies in a much stronger financial position than they are in at present. In such communities, an aggressive and intelligently conducted compaign of publicity, designed to place the true situation before the people, should be thoroughly worth while. The public must be brought to the realization that transportation service, like every other service, must be paid for, and that unprofitable service is necessarily bad service.

Lax Enforcement

A Prevalent Cause

Despite the universal demand for relief of congestion, the movement of vehicles in the streets of most cities continues to be obstructed through willful violation of traffic regulations



Congestion on a street in Kansas City where the curb is lined with parked automobiles despite a sign which says "No Parking Day or Night"

TRAFFIC congestion is costing the people of the United States $2,000,000,000 a year, according to figures of the National Conference on Street and Highway Safety. In the opinion of that body, the greatest single cause of congestion is automobile parking. Some progress toward relief has been made through the enactment of parking restrictions, but the violation of these restrictions is so frequent that a large part of their beneficial effect is being lost. Many automobile drivers pay little heed to traffic regulations. Despite signs prominently displayed to inform them of parking restrictions, they park where they please. All movement of persons and merchandise through the streets is hampered by the selfishness of those who violate the traffic rules, but the violators are seldom punished.

More than a hundred years ago, Baron Ellenborough, Lord Chief Justice of England, laid down the principle that "No one shall be permitted to use the King's highway as a stable yard." Fifty years ago most cities had ordinances forbidding horse-drawn vehicles to stand unattended on busy public streets. With the advent of the automobile, however, precedents were forgotten and the idea grew up that the driver of an automobile has an inalienable right to leave his vehicle standing in the street for as long a time as he desires.

In a recent study of the parking problem in the central business district of Washington, D. C., 22,815 owners of automobiles were asked whether they would be willing to pay for the use of off-street garage space to relieve congestion in the downtown streets, and if so, how much they would be willing to pay. A total of 17,103, or three out of every four, stated that they would not be willing to pay anything. The remainder indicated that they would be willing to pay a small amount, 10 cents being the most popular figure with 15 cents next, and a scattering few willing to pay amounts between 25 cents and 50 cents. These ideas are typical of millions of automobile owners everywhere. They are firmly convinced of their right to free use of the public streets for the storage of their automobiles and avail themselves of it regardless of restrictions and warning signs.

Statistics are not needed to prove that traffic regulations are being violated every day in every city in the country. It is a matter of common knowledge. Examples of violations in a dozen different cities are shown in accompanying illustrations. These pictures were secured quickly and easily by representatives of ELECTRIC RAILWAY JOURNAL. Nowhere was any difficulty encountered in finding obvious violations.

Violations of the time limit where parking is permitted for stated periods are also of frequent occurrence. It is rather difficult to measure the exact extent of this abuse, but data collected in a survey by the writer in conjunction with the Citizens' Street Traffic Committee of the City of New York are probably typical of conditions in most cities. In this survey, a check was made at hourly intervals of automobiles parked on various

# of Traffic Rules

of Congestion

By

JOHN A. MILLER, Jr.

Editor

Electric Railway Journal

Automobiles parked along a street in Detroit regardless of numerous "No-Parking" signs

streets in the midtown shopping district where one-hour parking is allowed. Of 16,468 vehicles checked, 4,775, or approximately 30 per cent of the total, overstayed the hour time limit. Automobiles to the number of 2,109 were parked more than two hours; 1,094 more than three hours; 635 more than four hours; 379 more than five hours; 245 more than six hours; 152 more than seven hours and 78 more than eight hours.

It is evident that an enormous number of automobile drivers will not voluntarily obey traffic regulations, and that efforts now being made to enforce the regulations fall far short of success. Two possible ways of improving the situation present themselves. One way would be to secure greater voluntary observance of the rules. The other would be to devise more effective methods of enforcement.

Much might be said in favor of encouraging voluntary adherence to traffic regulations. The automobile owner who creates congestion by his failure to observe parking restrictions unconsciously pays his share of the enormous cost of congestion. If the total cost were distributed evenly among the entire population of this country, it would amount to nearly $100 per family per year—a sum that would pay for a great deal of off-street parking. Were it possible to impress the facts on the owners of automobiles, they might see the matter in a new light.

The costs of congestion are mostly hidden, however, and it is difficult to convince the average man that he is really paying them. The shipper of merchandise whose vehicles are delayed by traffic congestion passes on to the ultimate consumer as much as possible of the cost. But when it is finally paid, it is so intermingled with other costs that the consumer does not recognize it. Congestion adds also to the costs of municipal government, which are borne by the tax payers and the rent payers. But here, again, the part which is attributable to congestion is so mixed in with a multitude of other costs that it is unrecognizable.

An educational campaign to bring the facts home to the general public would undoubtedly result in better observance of traffic regulations. There would always be a certain number of individuals, however, who would place their own immediate convenience above the general welfare and who would violate

Signs evidently mean little to automobile drivers in Cleveland

Automobiles parked solidly along the curb of a Boston street where parking is forbidden

An example of failure to observe parking regulations in downtown St. Louis

At left — Failures to observe the "No-Parking" rule in the area between the street car loading platform hampers vehicular traffic in Washington, D. C.

A violation of the parking rules in Newark, N. J.

Typical street scene in midtown New York where "No-Parking" signs are generally ignored

Traffic movement is hampered in Cincinnati, too, by failure to observe parking restrictions

At left—Rush-hour parking is forbidden in Los Angeles but the rule is not observed. One parked car completely blocks the extra traffic lane which should be available for moving vehicles

the regulations anyway. The action of these few individual violators would go a long way to offset the benefit resulting from better observance by the majority. A single automobile parked at a critical point will create a bottle neck that impedes all traffic movement on the street no matter how well traffic regulations are obeyed at other points. For that reason, it appears unlikely that the problem can ever be solved entirely by encouraging voluntary observance of traffic regulations. It is necessary also to adopt more effective methods of enforcement.

At present there are two principal obstacles in the way of effective enforcement. The first is the difficulty frequently experienced in serving a summons on a violator of traffic rules. The second is "ticket killing." Many drivers of automobiles feel safe in disobeying the regulations because they have enough influence to have a summons cancelled if they are unfortunate enough to get caught.

The practice in regard to serving a summons for a violation of traffic regulations varies in different localities. In some cities it is deemed sufficient for a police officer to tie a summons tag on the vehicle found violating the rules. This procedure is not altogether satisfactory however, because it gives the driver of the vehicle an opportunity to claim that he never saw the tag, that it was blown away or removed by some mischievous urchin or disappeared in some other way. Other cities require

Two languages is evidently not enough to secure attention for this "No-Parking" sign in the Province of Quebec

Parking violations near the busiest street intersection in New Haven

that the summons be served personally on the driver. For a police officer to do this involves the expenditure of a great deal of time, and very much limits his effectiveness in enforcing the regulations. One possible way to overcome this difficulty might be to seal a summons tag on the offending vehicle with a seal similar to those used on electric meters, etc. This plan would facilitate the issuing of summonses and would reduce the possibility of the autoist denying knowledge of the summons. Experiments are now being made along this line, but the plan has not yet been widely adopted.

Most of the trouble, however, arises after the summons has been issued. Nearly everyone has a friend, who has a friend, who knows somebody influential in the police department or the municipal government. By means of a little discreet wire pulling it is very often possible to get a parking ticket killed. Probably no one dislikes this practice more heartily than the police themselves, for it goes a long way to nullify their hard work. But the practice has become so well established everywhere that it would be asking too much of the police to expect that they should put an end to it themselves.

A practical solution of the problem appears to be the use of a triplicate tag system, such as is now in effect in a number of cities. Under this plan one copy of the summons goes to the driver of the offending vehicle, a second to the traffic bureau of the police department and the third to the judge of the municipal court. With this arrangement in effect the driver of an offending vehicle must do his wire pulling not only in the police department, but also in the court. Moreover, his activities in each place will be known in the other, and the difficulties in the way of getting a summons cancelled will be greatly increased.

The twin evils of non-observance and non-enforcement of traffic regulations are growing steadily worse. With an ever-increasing number of vehicles on the streets, more and more restrictions are becoming necessary. But they cannot afford relief of congestion when they are neither observed nor enforced. Aggressive leadership in remedying existing conditions is needed if complete stagnation of traffic is to be avoided.

Vehicles parked in restricted zone opposite a fire house in New York

WANTED—

A More Productive Fare Basis

An analysis of trends in fares, riding habit and passenger revenue 1918-1929 on electric railways serving nineteen important cities

By

JOHN A. BEELER

Consulting Engineer

DETERMINATION of a satisfactory fare structure is one of the major problems confronting the local transportation industry today. The structure should be one that will encourage and stimulate the use of the service, and, at the same time, provide sufficient revenue to cover the cost of operation. Enough reserve must be available from earnings to keep the transportation properties abreast of the times and give safe, comfortable and attractive service to the cities where they operate.

For a number of years but a few companies have earned sufficient revenue to accomplish this purpose. As a basis from which to consider this problem, it is interesting to study the trends in fares, riding habit and revenue between 1918, when practically all lines were operating at a 5-cent fare, and 1929, when the average rate of fare was much higher. Results of such a study in nineteen cities are shown in accompanying charts and in tables. The statistics are confined to surface line operations, or where surface lines are unified with rapid transit.

Each chart has three curves for the period from 1918 to 1929, showing the relation of each successive year to the 1918 figure, which is used as the base. These curves included for each city show: (a) the average fare; (b) the number of revenue passengers carried; and (c) the total passenger revenue.

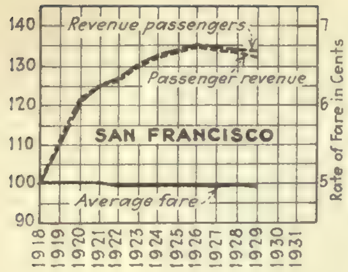
It will be noted that, as a general proposition, when the fare was raised the number of revenue passengers declined, and when it was lowered the passenger curve went higher. The passenger revenue, however, generally climbed higher with a raise in fare. In most instances when the rate reached a point about 45 per cent above the base, the fare curve passed through and above the passenger revenue curve. It appears that fare increases in excess of 45 per cent of the 1918 rate usually failed to increase the revenue. In the cities which retained the 5-cent fare during the entire period, the increase in both revenue and rides has been between 30 per cent and 35 per cent.

In the accompanying tables the change in population, a factor of vital importance, is taken into consideration. The following information is tabulated by years for each of the cities, showing: (a) average rate of fare; (b) total number of revenue passengers; (c) annual passenger revenue; (d) population; (e) revenue rides per capita; and (f) the passenger revenue per capita per annum. The trend of each of the foregoing items in

Fares, Riding Habit and Passenger Revenue per Capita—1918 and 1929 Compared

City	Company	Rate of Fare, Cents				Fare Trend*		Rides per Capita			Passenger Revenue per Capita		
		Cash	Aver.	Cash	Aver.	Cash	Aver.	1918	1929	Trend*	1918	1929	Trend*
		1918		1925									
Surface Lines													
San Francisco	Market St. Ry. and Municipal Ry.	5	4.97	5	4.90	100	99	405	426	105	$20.10	$20.85	104
Brooklyn	Brooklyn surface car lines only	5	4.78	5	4.98	100	104	175	184	105	8.36	9.17	110
Covington, Ky.	Cincinnati, Newport & Covtn. Ry.	5	4.99	5	4.99	100	100	278	311	112	13.90	15.50	111
Portland, Ore.	Pacific Northwest Public Service Co.	6	5.85	8	7.69	133	132	293	186	63	17.00	14.29	84
Los Angeles	Los Angeles Railway only	5	5.00	7	6.30	140	126	248	184	74	12.40	11.55	93
Milwaukee	Milwaukee Elec. Ry. & Light Co.‡	5	4.66	7	6.24	140	134	258	213	82	12.06	13.27	110
Newark	Public Service Co-ord. Transport	5	5.52	5	5.40	100	98	152	206	136	8.40	11.20	133
Cleveland	Cleveland Railway	4–5	4.44	7	7.18	155	162	324	230	71	14.35	16.50	115
Washington	Capital Traction Company only	5	4.43	8	7.34	160	166	187	118	63	8.28	8.67	104
Omaha	Omaha & Council Bluffs St. Ry.¶	5	4.91	10	6.70	200	136	296	184	62	14.55	12.33	85
Denver	Denver Tramway	5–6	5.17	8	7.48	145	144	245	172	70	12.67	12.86	101
Atlanta	Georgia Power Co. (Atlanta only)	5	5.00	10	7.71	200	154	354	231	65	17.65	17.75	101
St. Louis	St.Louis Pub. Serv. & Peoples Motorbus Co.	5–6	5.49	10	8.15	200	148	300	276	92	16.45	22.51	137
Houston	Houston Electric Company	5	4.88	10	7.77	200	159	243	155	64	11.85	12.00	101
Pittsburgh	Pittsburgh Railways	5	5.84	10	8.01	200	137	202	189	94	11.83	15.11	128
Buffalo	International Railway	5	4.96	10	8.41	200	169	219	180	82	10.87	15.10	139
Cincinnati	Cincinnati Street Railway	5	4.99	10	8.56	200	171	263	204	78	13.10	17.55	134
Unified Rapid Transit and Surface Lines													
Philadelphia	Philadelphia Rapid Transit System	5	5.19	8	7.69	160	148	332	328	99	17.28	25.23	146
Boston	Boston Elevated Railway	5–7	5.84	10	9.28	171	159	318	287	90	18.50	26.25	144

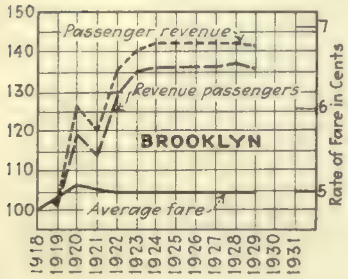
*Indicates relation of 1929 to 1918, the latter taken as 100 ‡Metropolitan district ¶Omaha only



San Francisco—Market Street Railway and Municipal Railway

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.97	100	197,398,636	100	$9,814,768	100	488,723	100	405	100	$20.10	100
1919	4.97	100	220,436,088	112	10,957,095	112	497,700	102	444	110	22.00	109
1920	4.97	100	240,888,425	122	11,967,952	122	506,676	104	475	117	23.60	117
1921	4.97	100	246,877,871	125	12,260,293	125	519,448	106	476	117	23.65	117
1922	4.96	100	249,977,066	127	12,405,009	126	532,220	109	470	116	23.35	116
1923	4.96	100	256,840,755	130	12,741,205	130	544,992	111	471	116	23.40	116
1924	4.96	100	261,372,480	133	12,962,334	132	557,764	114	469	116	23.25	115
1925	4.96	100	264,114,676	134	13,098,579	133	570,536	117	462	114	22.90	114
1926	4.96	100	266,508,220	135	13,211,607	135	583,308	120	457	113	22.65	113
1927	4.95	100	265,376,372	134	13,138,483	134	596,080	122	445	110	22.05	110
1928	4.97	100	263,909,302	134	13,127,002	134	608,852	125	434	107	21.60	107
1929	4.90	99	265,073,803	134	12,988,341	132	621,624	127	426	105	20.85	104

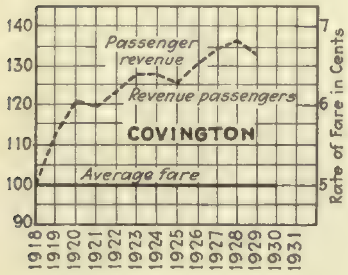
Fares: To Nov. 27, 1927—5 cents, children, 2½ cents. Nov. 27, 1927—Sunday pass added on Market Street Ry. for 20 cents.



Brooklyn—Surface Lines, Street Cars and Railway Company Buses Only

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.78	100	341,9[illegible]6,014	100	$16,342,449	100	1,959,015	100	175	100	$8.36	100
1919	4.92	103	343,742,496	101	16,897,749	103	1,998,568	102	172	98	8.46	101
1920	5.07	106	406,152,467	119	20,600,837	126	2,018,356	104	201	115	10.21	122
1921	5.01	105	387,675,071	113	19,435,750	119	2,067,140	106	187	107	9.40	112
1922	5.01	105	441,520,196	129	22,117,299	135	2,115,924	108	208	119	10.45	125
1923	5.01	105	459,314,669	134	22,995,936	141	2,164,708	110	212	121	10.62	127
1924	5.00	105	464,569,511	136	23,242,480	142	2,213,492	113	210	120	10.50	126
1925	5.00	105	464,135,927	136	23,184,158	142	2,262,276	116	205	117	10.23	122
1926	4.99	104	463,524,592	135	23,139,737	141	2,311,060	118	200	114	10.00	120
1927	4.99	104	466,450,772	136	23,266,824	142	2,359,844	121	198	113	9.87	118
1928	4.98	104	468,951,662	137	23,376,641	143	2,408,628	123	195	111	9.70	116
1929	4.98	104	461,706,656	135	22,991,779	141	2,506,196	128	184	105	9.17	110

Fares: 5 cents throughout. Aug. 1, 1919—Fare limits on some lines reduced and some transfers charged for at 2 cents.

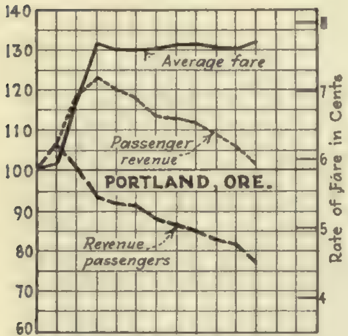


Covington, Ky.—Cincinnati, Newport & Covington Railway

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Amount	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.99	100	29,918,801	100	$1,492,589	100	107,477	100	278	100	$13.90	100
1919	4.98	100	33,783,945	113	1,683,016	113	109,275	102	309	111	15.40	111
1920	4.98	100	36,358,420	121	1,810,649	121	111,073	103	327	118	16.30	117
1921	4.98	100	35,937,934	120	1,788,524	120	112,871	105	318	114	15.85	114
1922	4.97	100	37,114,026	124	1,846,247	124	114,669	106	324	117	16.10	116
1923	4.97	100	38,412,641	128	1,910,283	128	116,467	108	330	119	16.40	118
1924	4.97	100	38,392,441	128	1,908,104	128	118,265	110	325	117	16.10	116
1925	4.97	100	37,757,341	126	1,871,262	126	120,063	112	314	113	15.60	112
1926	4.98	100	39,058,475	131	1,944,840	130	121,861	113	321	116	15.95	115
1927	4.99	100	40,256,115	134	2,009,923	134	123,659	115	326	117	16.25	117
1928	4.97	100	40,596,297	136	2,016,518	135	125,457	117	324	117	16.05	115
1929	4.99	100	39,630,600	133	1,978,777	132	127,255	118	311	112	15.50	111

Population includes Covington, Newport, Bellevue, Dayton, Fort Thomas, Ludlow.

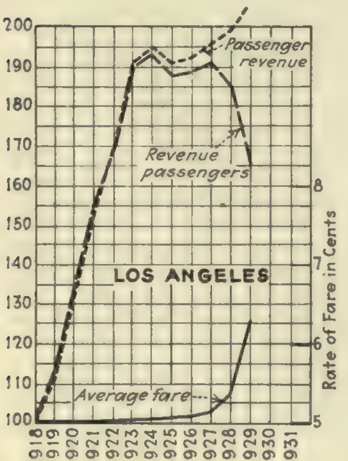
Fares—The fare has been and continues to be 5 cents, with free transfers.



Portland, Ore.—Pacific Northwest Public Service Company—City Lines, Street Car and Bus

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.85	100	72,066,277	100	$4,214,845	100	248,000	100	293	100	$17.00	100
1919	5.89	101	76,832,696	107	4,524,171	107	253,100	102	304	104	17.88	105
1920	6.86	117	72,836,886	101	4,997,829	118	258,288	104	282	96	19.35	114
1921	7.69	131	67,312,199	94	5,177,577	123	262,640	106	256	87	19.71	116
1922	7.63	130	66,218,164	92	5,052,065	120	266,993	107	248	85	18.92	111
1923	7.61	130	65,442,584	91	4,980,826	118	271,346	109	241	82	18.36	108
1924	7.60	130	63,507,797	85	4,826,763	114	275,700	111	230	78	17.51	103
1925	7.65	131	62,555,140	87	4,784,188	113	280,050	113	223	76	17.08	100
1926	7.65	131	61,525,608	85	4,708,597	112	284,400	115	213	73	16.56	97
1927	7.60	130	60,249,104	83	4,581,120	109	288,750	116	208	71	15.87	93
1928	7.59	130	58,859,393	82	4,468,773	106	293,100	118	200	68	15.25	90
1929	7.69	132	55,273,596	77	4,249,414	101	297,460	120	186	63	14.29	84

Fares: To Jan. 15, 1918—5 cents, school tickets 4 cents. Jan. 15, 1918—6 cents, 50 tickets $2.75, 25 limited school tickets $1. June 15, 1920—8 cents, 50 tickets $3.65, 6 tickets 45 cents, school tickets 25 for $1.



Los Angeles—Los Angeles Railway—Street Cars and Buses Only

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.00	100	130,358,704	100	$6,519,878	100	525,174	100	248	100	$12.40	100
1919	5.01	100	145,424,597	112	7,283,137	112	550,921	105	264	106	13.20	106
1920	5.01	100	179,227,041	137	8,980,243	138	576,673	110	311	126	15.57	125
1921	5.01	100	200,878,652	154	10,065,715	154	642,810	122	312	126	15.65	126
1922	5.02	100	219,022,470	168	10,989,500	169	708,947	135	309	125	15.50	125
1923	5.03	100	247,607,235	190	12,451,051	191	775,084	147	319	129	16.05	129
1924	5.04	100	252,401,433	194	12,729,653	195	841,221	160	300	121	15.12	122
1925	5.07	101	245,139,078	188	12,424,559	191	907,358	172	270	109	13.70	110
1926	5.09	102	246,390,732	189	12,546,174	193	973,495	185	254	102	12.91	104
1927	5.13	102	249,688,091	191	12,797,309	196	1,039,632	198	240	97	12.31	99
1928	5.37	107	241,453,498	185	12,966,603	199	1,105,769	210	219	88	11.70	94
1929	6.30	126	215,184,575	165	13,554,793	208	1,171,906	224	184	74	11.55	93

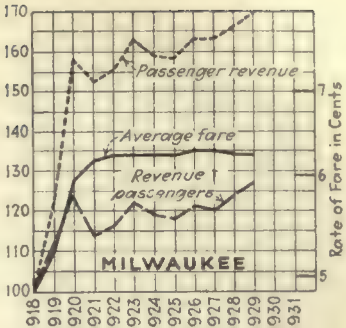
Fares: To Oct. 1, 1928—5 cents; students 2½ cents. Oct. 1, 1928—7 cents, 4 for 25 cents; students 40 for $1.40

Milwaukee—Milwaukee Electric Railway & Light Company
Milwaukee City and Suburban

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.66	100	144,149,000	100	$5,319,656	100	441,000	100	258	100	$12.06	100
1919	5.13	110	128,020,945	112	6,567,843	123	449,000	102	285	110	14.63	121
1920	5.95	128	141,183,945	124	8,406,007	158	532,000	121	265	103	15.80	131
1921	6.18	133	130,843,608	114	8,088,170	152	544,000	123	240	93	14.87	123
1922	6.24	134	132,193,455	116	8,253,541	155	549,000	124	241	93	15.03	125
1923	6.24	134	138,739,286	122	8,656,232	163	559,000	127	248	96	15.49	128
1924	6.25	134	135,542,845	119	8,465,418	159	570,000	129	238	92	14.85	123
1925	6.25	134	134,281,140	118	8,397,637	158	580,000	132	231	89	14.48	120
1926	6.28	135	137,865,993	121	8,656,263	163	595,000	135	232	89	14.55	121
1927	6.30	135	137,310,278	120	8,655,160	163	610,000	138	225	87	14.19	118
1928	6.25	134	140,998,687	124	8,819,111	166	645,000	146	218	84	13.67	113
1929	6.24	134	144,918,676	127	9,040,175	170	681,000	154	213	82	13.27	110

Population—includes City of Milwaukee and suburban area (Metropolitan District).

Fares: June 2, 1918—5 cents in city zone.
Nov. 3, 1919—7 cents, 6 for 35 cents, 18 for $1.
June 27, 1920—8 for 50 cents.

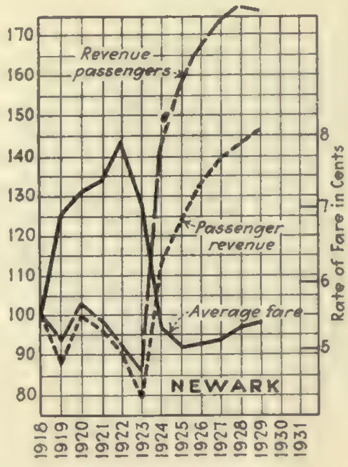


Newark—Public Service Co-ordinated Transport of New Jersey

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.52	100	352,190,897	100	$19,454,094	100	2,316,600	100	152	100	$8.40	100
1919(a)	6.91	125	327,619,606	93	22,648,692	117	2,378,800	103	138	91	9.55	114
1920	7.22	131	363,757,587	103	26,271,137	135	2,441,000	105	149	98	10.75	128
1921	7.38	134	348,284,212	99	25,720,489	132	2,503,200	108	139	91	10.25	122
1922	7.91	143	325,265,180	92	25,721,870	132	2,565,400	111	127	84	10.00	119
1923(b)	7.01	127	302,271,987	96	21,176,298	109	2,627,600	113	115	76	8.05	96
1924	5.31	96	493,760,744	140	26,222,801	135	2,689,800	116	183	120	9.75	116
1925	5.07	92	552,765,027	157	28,014,787	144	2,752,000	119	201	132	10.20	121
1926	5.13	93	588,409,332	167	30,160,188	155	2,814,200	122	209	137	10.70	127
1927	5.15	93	613,680,934	174	31,625,676	163	2,876,400	124	213	140	11.00	131
1928	5.35	97	624,944,613	177	33,405,829	172	2,938,600	127	213	140	11.40	136
1929	5.40	98	620,201,534	176	33,494,162	172	3,000,800	130	206	136	11.20	133

(*a*) Mile zone system in effect from Sept. 14 to Dec. 7.
(*b*) Strike this year.

Fares: To Aug. 1, 1918—5 cents, transfers free.
Aug. 1, 1918—5 cents, transfers 1 cent.
Oct. 15, 1918—7 cents, transfers 1 cent.
April 1, 1919—6 cents, transfers 1 cent.
May 4, 1919—7 cents, transfers 1 cent.
Sept. 14, 1919—3 cents first mile, 2 cents each succeeding mile.
Nov. 16, 1919—5 cents first two miles, 1 cent each succeeding mile, transfers 1 cent.
Dec. 7, 1919—7 cents, transfers 1 cent.
Aug. 4, 1921—7 cents, transfers 2 cents.
Oct. 20, 1921—8 cents, 4 for 30 cents, transfers 1 cent.
Oct. 1, 1923—5 cents in all large communities, 5-cent zones outside; no transfers.

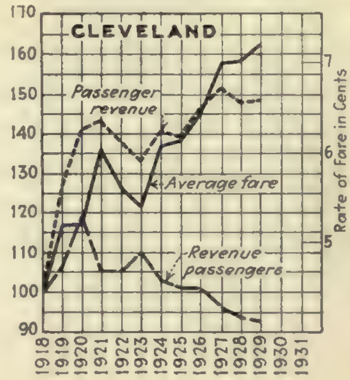


Cleveland—Cleveland Railway

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.44	100	273,239,716	100	$12,120,811	100	844,799	100	324	100	$14.35	100
1919	5.22	117	291,419,501	107	15,223,060	126	867,158	103	336	101	17.55	122
1920	5.21	117	327,840,438	120	17,072,999	141	889,517	105	369	114	19.20	134
1921	6.04	136	286,844,527	105	17,336,685	143	911,876	108	315	97	19.00	132
1922	5.81	131	286.587,977	105	16,647,736	137	934,235	111	307	95	17.85	124
1923	5.36	121	300,122,816	110	16,091,100	133	956,594	113	312	96	16.80	117
1924	6.09	137	279,917,221	102	17,056,904	140	978,953	116	286	88	17.45	122
1925	6.14	138	276,449,391	101	16,980,165	140	1,001,312	119	276	85	16.95	118
1926	6.43	145	275,527,421	101	17,715,586	146	1,023,671	121	269	83	17.30	121
1927	7.01	158	262,314,932	96	18,392,863	152	1,046,030	124	251	77	17.60	123
1928	7.01	158	255,715,219	94	17,914,371	148	1,068,389	127	240	74	16.80	117
1929	7.18	162	250,966,928	92	18,009,329	149	1,090,748	129	230	71	16.50	115

Population includes Cleveland, Cleveland Heights, East Cleveland, Lakewood, Euclid, South Euclid, Fairview, Garfield Heights, Parma, Rocky River.

Fares: To Dec. 15, 1917—3 cents.
Dec. 15, 1917—4 cents, 3 for 10 cents.
April 3, 1918—4 cents, 7 for 25 cents.
Aug., 1918—5 cents.
July 7, 1919—5 cents, 11 for 50 cents.
Dec. 16, 1919—5 cents, 6 for 25 cents.
May 10, 1920—5 cents.
Nov. 19, 1920—6 cents, 9 for 50 cents.
Aug. 1, 1922—5 cents, 5 for 25 cents.
March 1, 1923—5 cents, 11 for 50 cents.
Sept. 1, 1923—5 cents.
Jan. 1, 1924—6 cents, 9 for 50 cents.
Oct. 15, 1926—7 cents, 8 for 50 cents; students, 10 for 25 cents (discontinued October, 1929).
Transfers—1 cent throughout.



Washington, D. C.—Capital Traction Company

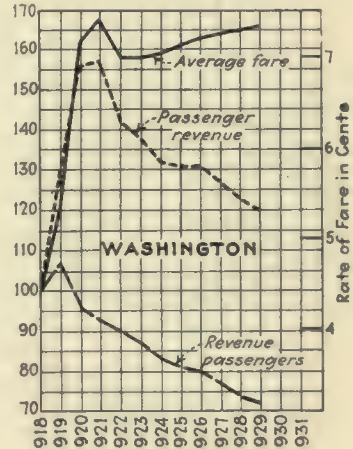
Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.43	100	78,790,220	100	$3,490,699	100	421,116	100	100	100	$8.28	100
1919	5.36	121	84,261,915	107	4,516,209	129	432,085	103	195	104	10.45	126
1920	7.16	162	75,950,416	96	5,435,963	156	437,571	104	173	92	12.42	150
1921	7.44	168	73,474,329	93	5,472,924	157	444,785	105	165	88	12.30	148
1922	7.01	158	70,886,927	90	4,966,341	142	449,594	107	158	84	11.05	133
1923	7.02	158	68,652,870	87	4,819,321	138	454,403	108	151	81	10.61	128
1924	7.05	159	65,150,701	83	4,593,151	132	459,212	109	142	76	10.00	121
1925	7.11	161	64,204,731	81	4,563,918	131	464,022	110	138	74	9.84	119
1926	7.23	163	63,525,339	80	4,589,951	131	468,832	111	135	72	9.79	118
1927	7.29	164	60,797,299	77	4,430,777	127	473,642	112	128	69	9.35	113
1928	7.31	165	58,617,391	74	4,284,460	123	478,452	113	122	65	8.95	108
1929	7.34	166	56,991,321	72	4,184,842	120	483,262	115	118	63	8.67	104

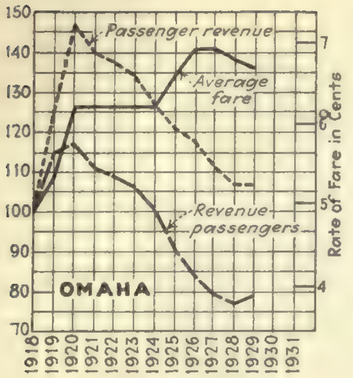
Population—Figures for the District of Columbia are estimates furnished by the Census Bureau March 31, 1931

This Company carries about 43 per cent of the total revenue passengers carried in Washington.

Revenue Passengers and Passenger Revenue—includes street railway and bus passengers in the District of Columbia and Maryland, 25 cent passengers on Deluxe Bus Lines and miscellaneous fare passengers on other bus lines.

Fares in D. C.—To Oct. 26, 1918, 5 cents, 6 for 25 cents, transfers free.:
Oct. 26, 1918—5 cents, transfers free
June 1, 1919—5 cents, transfers 2 cents.
Nov. 1, 1919—7 cents, 4 for 25 cents, inter-company transfers 2 cents.
May 1, 1920—8 cents, 4 for 30 cents, inter-company transfers 2 cents.
Jan. 1, 1921—8 cents, 4 for 30 cents, inter-company transfers 1 cent.
Sept. 1, 1921—8 cents, 5 for 35 cents, inter-company transfers 1 cent.
March 1, 1922—8 cents, 6 for 40 cents, inter-company transfers 1 cent.

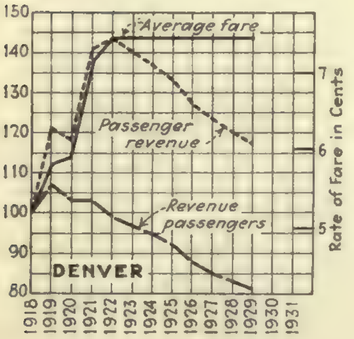




Omaha, Neb.—Omaha & Council Bluffs Street Railway

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.91	100	52,726,355	100	$2,591,800	100	178,100	100	296	100	$14.55	100
1919	5.40	109	60,508,416	115	3,276,738	126	184,851	104	328	111	17.73	122
1920	6.20	126	61,650,839	117	3,821,453	147	191,601	108	322	109	19.94	137
1921	6.20	126	58,807,511	111	3,641,502	140	196,000	110	300	101	18.58	128
1922	6.20	126	57,964,812	109	3,589,623	138	200,000	112	290	98	17.95	123
1923	6.20	126	56,063,792	106	3,472,658	134	204,382	115	274	93	16.99	117
1924	6.20	126	53,274,810	101	3,299,169	127	208,025	117	256	87	15.86	109
1925	6.60	134	47,955,017	91	3,154,850	121	211,668	119	228	77	14.90	102
1926	6.95	141	44,110,420	84	3,061,611	118	215,412	121	205	69	14.21	[illegible]
1927	6.95	141	41,498,612	79	2,875,942	111	219,200	123	189	64	13.12	90
1928	6.80	138	40,709,542	77	2,760,661	107	222,800	125	182	62	12.39	85
1929	6.70	136	41,426,482	79	2,779,504	107	225,481	127	184	62	12.33	85

Fares: To Aug. 10, 1919—5 cents.
Aug. 10, 1919—7 cents, 4 for 25 cents.
June 10, 1925—10 cents, 6 for 40 cents.
March 20, 1928—10 cents, 3 for 20 cents.

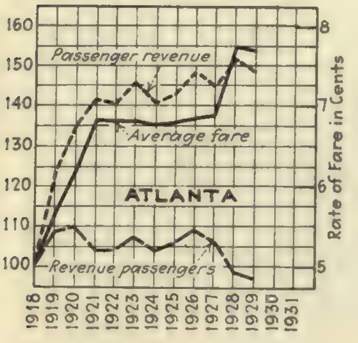


Denver—Denver Tramway Corporation
Urban and Suburban Railway and Buses

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.17	100	62,549,114	100	$3,234,017	100	255,196	100	245	100	$12.67	100
1919	5.83	112	66,844,565	107	3,897,058	121	258,845	101	258	105	15.05	118
1920	5.92	114	64,162,867	103	3,801,351	118	262,494	103	244	99	14.48	114
1921	7.14	138	64,260,862	103	4,585,260	141	266,143	104	241	98	17.23	136
1922	7.47	144	62,328,941	99	4,655,840	144	269,792	106	231	94	17.29	136
1923	7.47	144	60,659,459	97	4,529,800	140	273,442	107	221	90	16.56	130
1924	7.48	144	59,240,478	95	4,431,736	137	277,091	109	213	87	15.95	126
1925	7.48	144	57,636,466	92	4,311,138	133	280,739	110	205	84	15.36	121
1926	7.48	144	55,059,811	88	4,116,044	127	284,388	111	194	79	14.47	114
1927	7.48	144	53,138,325	85	3,972,726	123	288,037	113	184	75	13.79	109
1928	7.48	144	51,983,816	83	3,887,263	120	291,687	114	178	73	13.32	105
1929	7.48	144	50,817,087	81	3,799,112	117	295,336	116	172	70	12.86	101

Population Includes—Denver, Englewood, Aurora and Edgewater.

Fares: To Sept. 15, 1918—5 cents, transfers free.
Sept. 15, 1918—6 cents, transfers free.
Dec. 26, 1918—7 cents, transfers 1 cent.
Jan. 15, 1919—6 cents, transfers free.
July 5, 1919—5 cents, transfers free.
July 31, 1919—6 cents, transfers free.
Oct. 29, 1919—5 cents, transfers free.
Nov. 14, 1919—6 cents, transfers free.
March 16, 1921—8 cents, 2 for 15 cents.
Children half fare throughout.

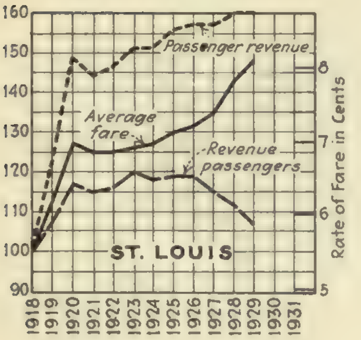


Atlanta—Georgia Power Company—Atlanta Railway and Railway Buses

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.00	100	70,575,593	100	$3,528,780	100	199,916	100	354	100	$17.65	100
1919	5.67	113	76,804,565	109	4,354,820	123	208,588	104	358	101	20.90	119
1920	6.15	123	77,284,154	110	4,752,975	135	217,260	108	356	101	21.90	124
1921	6.84	137	73,611,786	104	5,035,046	142	225,932	113	326	92	22.25	126
1922	6.81	136	73,255,211	104	4,988,680	141	234,604	117	312	88	21.20	120
1923	6.81	136	75,518,711	107	5,142,824	146	243,276	122	311	88	21.15	120
1924	6.76	135	73,413,026	104	4,962,720	141	251,948	126	292	82	19.75	112
1925	6.78	136	74,722,108	105	5,064,953	143	260,620	130	287	84	19.45	110
1926	6.84	137	76,934,132	109	5,265,224	149	269,292	135	286	81	19.55	111
1927	6.87	137	74,593,740	106	5,122,666	145	277,964	139	269	76	18.45	105
1928	7.75	155	69,305,318	98	5,368,503	152	286,636	143	242	68	18.75	106
1929	7.71	154	68,106,459	97	5,249,098	149	295,308	148	231	65	17.75	101

Population includes Atlanta, Decatur, College Hill, Hopeville, East Point.

Fares: To April 14, 1919—5 cents.
April 14, 1919—6 cents, 17 for $1.
Sept. 1, 1919—6 cents.
Oct. 1, 1920—7 cents, 15 for $1.
July 1, 1923—7 cents, 3 for 20 cents.
Dec. 15, 1927—10 cents, 4 for 30 cents, 20 for $1.50; students, 20 for $1.
Transfers free throughout.



St. Louis—St. Louis Public Service Company and Peoples Motor Bus Company

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.49	100	248,173,901	100	$13,626,177	100	828,500	100	300	100	$16.45	100
1919	6.24	113	266,082,823	107	16,612,887	122	838,400	101	317	105	19.81	120
1920	6.99	127	290,507,028	117	20,316,002	149	848,400	102	342	114	23.95	145
1921	6.89	125	285,518,813	115	19,658,750	144	861,600	104	331	110	22.82	138
1922	6.88	125	288,984,525	116	19,895,049	146	874,800	105	330	110	22.74	138
1923*	6.92	126	298,582,233	120	20,673,897	151	888,100	107	336	112	23.28	141
1924	7.02	127	294,276,241	118	20,674,240	151	901,300	109	326	109	22.94	138
1925	7.17	130	296,575,847	119	21,259,215	156	914,500	110	324	108	23.25	141
1926	7.17	131	296,728,161	119	21,319,953	157	927,700	112	319	106	22.98	139
1927	7.43	135	286,478,439	115	21,328,969	157	940,900	113	304	101	22.67	138
1928	7.85	143	278,191,173	112	21,800,213	160	954,200	115	292	97	22.85	139
1929	8.15	148	266,510,269	107	21,775,520	160	967,400	117	276	92	22.51	137

*Peoples Motor Bus Company began operations in May, 1923.

Population is for territory served.

Fares: To June 1, 1918, 5 cents, transfers free.
June 1, 1918—6 cents, transfers free.
Sept. 20, 1919—8 cents, two for 15 cents, 7 for 50 cents, transfers free.
April 10, 1920—7 cents, transfers free.
July 5, 1927—8 cents, two for 15 cents, transfers free.
Jan. 15, 1928—Sunday and holiday pass, 25 cents, added.
July 1, 1928—8 cents straight, transfers free with passes continued.
Aug. 26, 1929—10 cents cash, 12 rides weekly for 90 cents with excess rides at 5 cents, transfers free, passes continued.
Dec. 15, 1929—10 cents cash, 12 rides weekly for $1 with excess rides at 5 cents, transfers free, passes continued.
Children 3 cents, April 10, 1920 to Dec. 15, 1929; since then 5 cents, 6 for 25 cents.
Bus fare is 10 cents.

Houston—Houston Electric Company—Houston Railway and Bus

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.88	100	31,098,142	100	$1,518,264	100	128,000	100	243	100	$11.85	100
1919	4.87	100	35,169,346	113	1,711,716	112	132,000	103	266	109	12.95	109
1920	6.28	129	35,222,621	114	2,213,235	146	138,000	108	255	105	16.00	135
1921	6.82	140	30,646,686	99	2,091,370	138	153,000	119	200	82	13.65	115
1922	6.64	136	29,476,521	95	1,956,599	129	168,000	131	175	72	11.65	98
1923	6.47	133	31,169,801	100	2,015,910	133	183,000	143	170	70	11.00	93
1924*	6.45	132	38,028,371	123	2,452,856	161	198,000	155	192	79	12.35	104
1925	6.42	131	39,874,216	129	2,560,466	169	214,000	167	187	77	12.00	101
1926	6.49	133	42,171,850	136	2,727,846	180	229,000	179	184	76	11.95	101
1927	7.28	149	41,264,223	133	3,003,365	198	244,000	191	169	70	12.30	104
1928	7.81	160	41,783,980	134	3,265,094	215	259,000	202	161	66	12.60	106
1929	7.77	159	42,409,591	137	3,295,832	217	274,000	214	155	64	12.00	101

*Buses began operation April 1924.

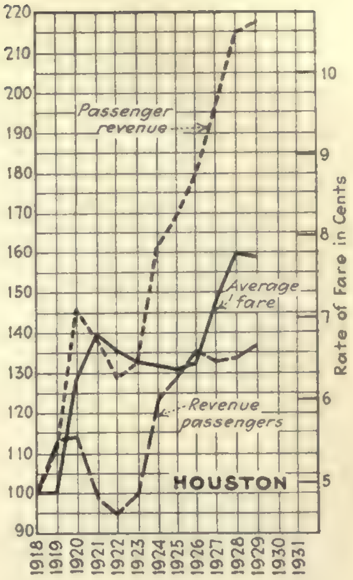
Fares: To April 4, 1920—5 cents, transfers free.

April 4, 1920—7 cents, transfers free.

Feb. 22, 1922—7 cents, 4 for 25 cents, transfers free.

June 13, 1927—Local 10 cents, 4 for 30 cents; 25-cent weekly card allowing rides for 5 cents; children 4 cents.

Express bus fare 10 cents, children 5 cents; transfers free except from local to express service.



Pittsburgh, Pa.—Pittsburgh Railways

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.84	100	232,823,184	100	$13,631,394	100	1,152,343	100	202	100	$11.83	100
1919	6.70	115	240,659,991	103	16,074,565	118	1,169,078	101	206	102	13.75	116
1920	7.51	128	277,215,089	119	20,779,615	152	1,185,808	103	234	116	17.52	148
1921	7.94	136	265,059,155	114	21,056,886	154	1,200,458	104	220	109	17.54	148
1922	7.97	136	261,850,401	112	20,831,829	153	1,215,108	105	216	107	17.14	145
1923	7.93	136	279,478,055	120	22,170,484	162	1,229,758	107	228	113	18.03	152
1924	7.94	136	272,315,161	117	21,644,568	159	1,244,408	108	219	108	17.39	147
1925	7.96	136	269,345,924	115	21,399,730	157	1,259,058	109	214	106	17.00	144
1926	7.96	136	267,721,759	115	21,285,732	156	1,273,708	110	210	104	16.71	141
1927	7.98	137	262,061,272	112	20,895,633	153	1,288,358	112	204	101	16.22	137
1928	8.00	137	251,784,571	108	20,154,579	148	1,303,008	113	193	95	15.47	131
1929	8.01	137	248,451,956	107	19,904,717	146	1,317,658	114	189	94	15.11	128

Fares: To Jan. 22, 1918—5 cents.

Jan. 22, 1918—6 cents, 2 for 11 cents.

June 20, 1918—5-cent and 7-cent zones; tickets in 7-cent zones 8 for 55 cents.

Aug. 1, 1919—10-cent zones, 4 tokens 30 cents.

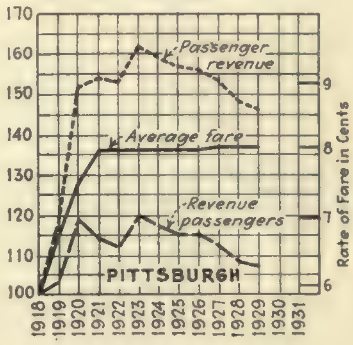
Sept. 1, 1920—10 cents, 3 for 25 cents; pay transfers at 234 points, free transfers at 71 points.

Oct. 26, 1924—25-cent Sunday and holiday passes added in city zone.

March 1, 1925—40-cent Sunday and holiday inter-zone pass added.

June 1, 1925—$1.50 weekly pass added.

July 24, 1926—5 cents without transfer on one route for four months.



Buffalo, N. Y.—International Railway—Bus and Street Car

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.96	100	108,141,180	100	$5,362,683	100	493,515	100	219	100	$10.87	100
1919	4.95	100	131,202,855	121	6,501,651	120	500,145	101	262	120	13.00	120
1920	5.83	117	136,242,730	126	7,943,549	146	506,775	103	269	123	15.67	144
1921	6.21	125	124,237,484	115	7,719,425	143	513,405	104	242	110	15.03	138
1922	6.22	125	84,945,745	79	5,286,334	98	520,035	105	163	74	10.16	93
1923	6.23	126	113,191,762	105	7,053,222	130	526,665	107	214	98	13.39	123
1924	6.23	126	121,787,497	113	7,589,970	140	533,295	108	229	105	14.23	131
1925	7.29	147	113,867,070	105	8,307,573	153	539,925	109	211	96	15.39	142
1926	7.54	152	113,533,546	105	8,562,389	158	546,555	111	208	95	15.67	144
1927	7.97	160	106,762,268	99	8,508,523	157	553,185	112	193	88	15.38	142
1928	8.41	169	103,093,581	96	8,672,696	159	559,815	113	184	84	15.49	143
1929	8.41	169	101,648,139	94	8,551,518	158	566,445	115	180	82	15.10	139

Population—Prorated from given population for years 1920 and 1930.

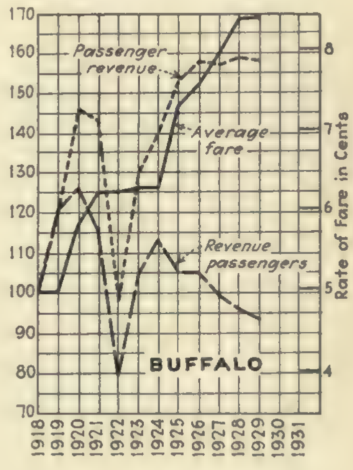
Fares: To April 18, 1920—5 cents.

April 18, 1920—7 cents, 4 for 25 cents.

March 3, 1925—8 cents, 2 for 15 cents.

July 1, 1927—10 cents, 3 for 25 cents.

Bus fare 10 cents, except one line at street car fare. Transfers car to car or bus to bus free; from car to bus free with 10 cent fare.



Cincinnati—Cincinnati Street Railway

Includes buses operated by Railway Company but excludes buses operated by Independents

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	4.99	100	112,400,000	100	$5,609,000	100	427,816	100	263	100	$13.10	100
1919	6.28	126	117,200,000	104	7,359,000	131	434,220	101	270	103	16.95	129
1920	7.44	149	118,000,000	105	8,780,000	156	440,624	103	268	101	19.90	152
1921	8.18	164	106,527,800	95	8,715,000	155	447,028	104	238	91	19.50	149
1922	7.52	151	107,528,700	96	8,090,000	144	453,432	106	237	90	17.85	136
1923	7.64	153	108,625,600	97	8,303,000	148	459,836	107	236	90	18.10	138
1924	9.15	183	100,839,300	90	9,227,000	183	466,240	109	218	83	19.75	151
1925	9.60	192	90,629,900	81	8,698,423	157	472,644	110	192	73	18.40	140
1926	8.55	171	93,597,745	83	7,998,083	142	479,048	112	196	75	16.70	127
1927	8.55	171	100,822,449	90	8,617,331	153	485,452	113	208	79	17.75	135
1928	8.54	171	102,349,759	91	8,739,879	156	491,856	115	208	79	17.75	135
1929	8.56	171	101,901,708	91	8,725,059	156	498,260	116	204	78	17.55	134

Population includes Cincinnati, Norwood, St. Bernard, Elmwood Place, Cheviot.

Fares: To Jan. 1, 1919—5 cents.

Jan. 1, 1919—6 cents, tickets 5½ cents.

April 1, 1919—6 cents.

July 1, 1919—7 cents, tickets 6½ cents.

Oct. 1, 1919—7 cents, 5 for 35 cents.

June 1, 1920—8 cents, tickets 7½ cents.

Sept. 1, 1920—8 cents, 5 for 40 cents.

Dec. 1, 1920—9 cents, 6 for 51 cents.

Aug. 1, 1921—8 cents, 5 for 40 cents.

Nov. 1, 1921—8 cents, 2 for 15 cents.

Oct. 1, 1923—8 cents.

Jan. 1, 1924—9 cents, 6 for 51 cents.

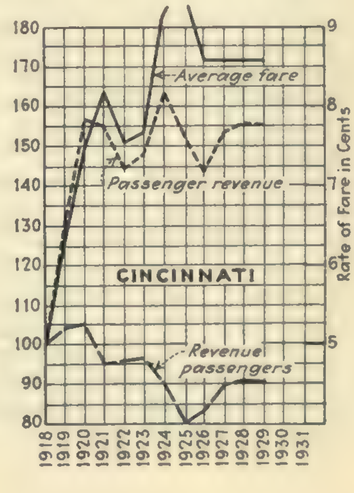
April 1, 1924—9 cents.

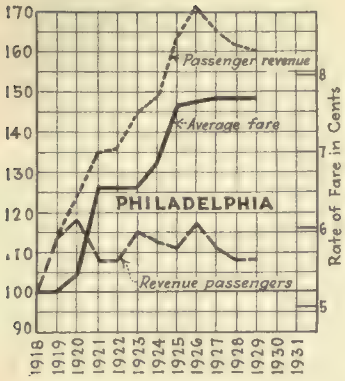
July 1, 1924—10 cents, 6 for 57 cents; children 5 cents, 4 for 19 cents.

Nov. 1, 1925—10 cents, 3 for 25 cents; children 5 cents, 6 for 25 cents.

Nov. 14, 1926—Sunday pass, 25 cents, added.

Transfers free throughout.



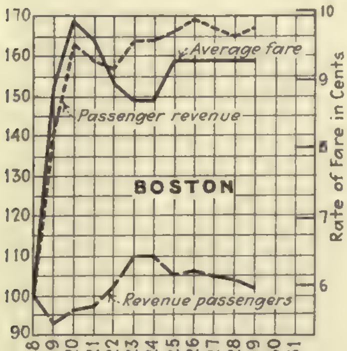


Philadelphia—Philadelphia Rapid Transit System—Surface Rail, Subways & Elevated, and Bus Lines

Year	Average Fare Cents	Average Fare Index	Revenue Passengers* Number	Revenue Passengers* Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.19	100	588,744,416	100	$30,568,788	100	1,768,824	100	332	100	$17.[illegible]	100
1919	5.20	100	655,841,381	113	34,739,590	113	1,796,301	101	371	112	19.34	112
1920	5.46	105	699,169,280	119	37,989,623	124	1,823,779	103	383	115	20.83	120
1921	6.54	126	633,614,768	108	41,416,998	135	1,836,497	104	344	104	22.55	130
1922	6.51	126	635,971,042	108	41,664,742	136	1,849,215	104	344	104	22.53	130
1923	6.53	126	676,606,277	115	44,234,060	145	1,861,933	105	363	109	23.76	137
1924	6.84	132	663,322,967	113	45,299,370	148	1,874,651	106	354	107	24.16	140
1925	7.56	146	659,477,206	112	49,892,965	163	1,887,369	107	349	105	26.44	153
1926	7.61	147	688,298,970	117	52,480,836	172	1,900,087	107	362	109	27.62	160
1927	7.66	148	656,693,274	111	50,362,420	165	1,912,805	108	344	104	26.33	152
1928	7.70	148	639,255,580	108	49,163,230	161	1,925,523	109	332	100	25.53	148
1929	7.69	148	635,986,263	108	48,898,612	160	1,938,242	110	328	99	25.23	146

*Passengers using 3-cent exchanges considered revenue passengers.

Fares: To July 1, 1920—5 cents with 3-cent exchange and certain free transfers.
July 1, 1920—Fare zones on suburban lines increased.
Nov. 1, 1920—7 cents, 4 for 25 cents.
Sept. 25, 1924—8 cents, 2 for 15 cents, 3-cent exchanges eliminated except in central district; rate in suburban zones 5 cents.



Boston—Boston Elevated Railway

Year	Average Fare Cents	Average Fare Index	Revenue Passengers Number	Revenue Passengers Index	Pass. Revenue Amount	Pass. Revenue Index	Population Number	Population Index	Revenue Rides Per Capita Number	Revenue Rides Per Capita Index	Pass. Revenue Per Capita Amount	Pass. Revenue Per Capita Index
1918	5.84	100	348,664,700	100	$20,352,412	100	1,098,692	100	318	100	$18.50	100
1919	8.86	152	324,758,685	93	28,767,544	141	1,111,990	101	292	92	25.80	138
1920	9.87	169	335,526,561	96	33,108,946	163	1,125,290	102	298	94	29.40	159
1921	9.56	164	337,252,080	97	32,253,630	159	1,137,259	104	296	93	28.45	145
1922	8.93	153	356,593,942	102	31,834,023	157	1,149,228	105	310	98	27.75	145
1923	8.71	149	382,149,697	110	33,297,952	164	1,161,197	106	329	104	28.65	155
1924	8.73	149	382,888,848	110	33,419,172	164	1,173,166	107	326	103	28.50	154
1925	9.26	159	365,036,286	105	33,790,442	166	1,185,135	108	308	97	28.50	154
1926	9.27	159	371,218,401	106	34,393,954	169	1,197,104	109	310	98	28.75	155
1927	9.27	159	366,938,908	105	34,000,571	167	1,209,073	110	304	96	28.15	152
1928	9.29	159	362,005,033	104	33,616,877	165	1,221,042	111	296	93	27.55	149
1929	9.28	159	354,214,990	102	32,885,588	167	1,233,011	112	287	90	26.65	144

Population includes—Boston, Brookline, Watertown, Cambridge, Belmont, Sommerville, Arlington; and one-half of: Medford, Malden, Everett, Chelsea.

Fares: To Aug. 1, 1918—5 cents.
Aug. 1, 1918—7 cents.
Dec. 1, 1918—8 cents.
July 10, 1919—10 cents.
Nov. 14, 1921—10 cents, certain surface line short hauls 5 cents.
Nov. 5, 1924—10 cents, certain surface line short hauls 5 for 30 cents.
July 1, 1927—10 cents, certain surface line short hauls 4 for 25 cents.
Transfers: Free throughout on full fares, none on short hauls.
School tickets: Since Dec. 1, 1918, 5 cents, transfers free'

its relation to the 1918 base figures, taken as 100, is likewise shown.

It will be seen that in the group of surface line cities where the 5-cent fare has been retained during the intervening years the revenue per capita has increased 5 to 10 per cent or more, while in the cities where the fares have been raised it has shown an average increase of 15 per cent. The more recent increases have not been as successful in raising the revenue curve as were the earlier increases.

The trend in revenue rides per capita has been upward to the extent of 5 per cent to 10 per cent or more in the 5-cent fare cities, but downward in the other cities, approximately 26 per cent. While the 5-cent fare has a greater appeal to patrons than the higher fares and builds up traffic, unfortunately it does not produce sufficient revenue under existing conditions. This is especially true when it is employed as a city-wide fare rate. In certain cities where unusual conditions prevail, exceptions to this rule may exist, but such instances are few and far between. In communities where the 5-cent fare continues in effect, the average number of rides for each inhabitant is about 40 per cent greater than in the other cities.

In Philadelphia and Boston, where a unified system of rapid transit and surface lines are operated under one management, the riding habit is notably higher and the passenger revenue per capita is higher than in cities served by surface lines alone. This is undoubtedly due to the faster service afforded by the rapid transit arteries in combination with the surface lines as feeders.

To secure increased revenues, the necessity of increasing and building up the riding habit is apparent. That this is possible is fairly well evidenced by the results obtained in the communities where 5-cent fares are still in vogue. While various factors have contributed to this result the 5-cent fare has apparently been one of the most influential in attracting business. For, whether it be San Francisco, Covington, or Brooklyn, the per capita riding habit shows a similar upward trend, regardless of the steady increase in automobile competition and other adverse factors.

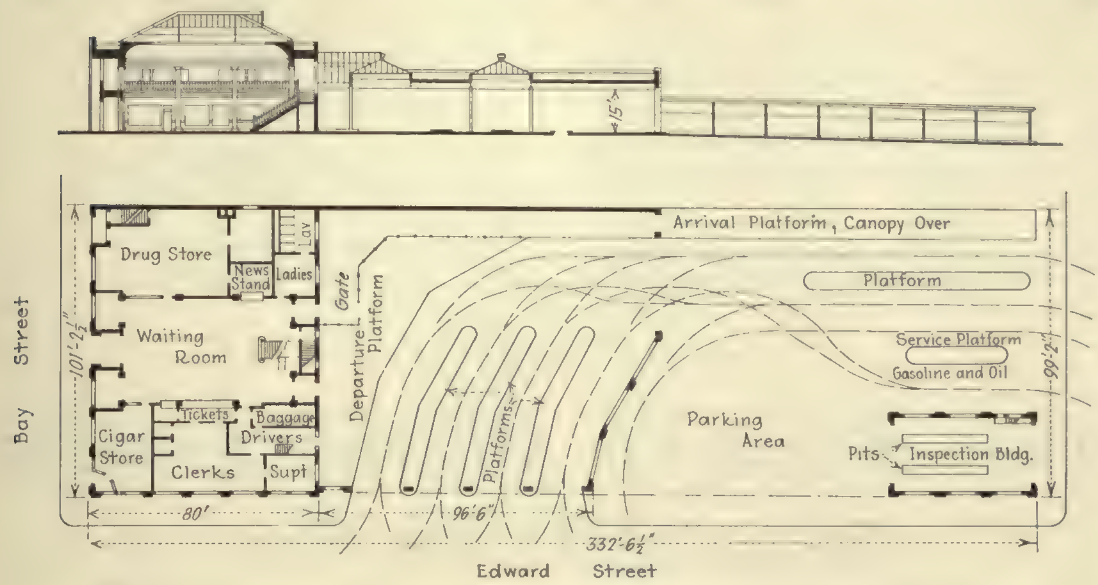
Horizontal fare raises unfortunately have had the cumulative effect of lowering the riding habit, encouraging competition, and stimulating walking. This loss in patronage has resulted in many instances in insufficient revenues, even where the rate of fare is regarded by the management as a maximum.

I believe the railways must hold fast to what they have and seek to regain the class of riders whose patronage has been lost through the policy of flat fare increases. Generally, the largest losses have been among the short riders. The short 5-cent zone method offers an opportunity to stimulate this class of riding. Already astonishingly large increases in zone patronage have resulted in a number of cities where the plan has been tried out.

This method is more flexible than the inner and outer zone plan which in many instances has been regarded as discriminatory by the public, and proved generally unpopular with the residents of the outer zones particularly. Again, zones based on distance alone, while technically fair and proper, have not been well received.

A system of unit 5-cent zones, properly laid out and superimposed upon an adequate basic city-wide fare, offers potential short-haul riders a more equitable and attractive fare without putting an undue burden on those who ride longer distances, and makes for greater simplicity of fare structure than other zone systems.

Toronto to Have Modern Bus Terminal



This modern interurban bus terminal is being erected to serve all the lines centering in Toronto

CONSTRUCTION of a modern terminal for interurban motor coaches, at an estimated cost of $195,000 has been decided on by the Toronto Transportation Commission. Now the majority of the interurban coach lines running into Toronto operate from an uncovered loading area owned by the commission, at Bay Street and Edward Street. Passenger facilities are provided in rented premises adjacent. The growth of the business has been such that these facilities are inadequate, and construction of the new terminal on the same site will be commenced immediately.

The terminal will occupy a site 100x332 ft. on the south side of Edward Street stretching from Bay Street to Elizabeth Street. This site, purchased in 1928 for $250,000, is extremely favorable, as it is located on Bay Street, one of the main north and south thoroughfares. It is removed from the congested traffic district but is within easy walking distance of the principal retail and business centers. It is only a few feet from one of the main cross-town street car intersections.

The main terminal building will be a two-story structure having a frontage on Bay Street of 100 ft. and a depth on Edward Street of 80 ft. At the rear, will be a one-story covered loading area, containing four driveways separated by concrete platforms. On the corner of Elizabeth and Edward Streets, there will be an inspection building containing two pits. The remainder of the property will be occupied by the arrival platforms, gas and oil facilities, and parking area for coaches.

Coaches will enter from Elizabeth Street, and passengers will be discharged at a covered arrival platform. Coaches will then proceed to the departure platforms in the covered area and will make their exit on to Edward Street. If a stopover is required, the coach, after unloading its passengers, will circle back into the parking area, or into the inspection building, or to the service platform, as required.

Entrance for passengers will be from Bay Street and access to the loading platforms will be at the opposite end of the building. The central waiting room will extend to the full height of the building, with an ornamental skylight in the ceiling. The waiting room will be surrounded by an open mezzanine gallery which will be used as a lounge by passengers, access being obtained by a staircase at the west of the waiting room.

Information and ticket counters, baggage room and dispatcher's desk will be located along the north side of the waiting room. The remainder of this wing will accommodate the superintendent's office, clerical office and drivers' reporting office. Restroom and lavatory for women will be on the main floor and lavatories for men will be in the basement. The drivers' restroom and lavatory will be on the second floor, with direct access from their reporting room.

Space for a cigar store, a combination drug store and lunch counter, and a news stand have been reserved. With the exception of the drivers' accommodation, the entire second floor is available for rental as offices or showrooms, opening from the mezzanine gallery, but with direct stair to the street. It is anticipated that the rentals will pay a considerable proportion of the carrying charges of the terminal.

The exterior of the building will be faced with Queenston limestone, and the windows and spandrels, store front and street doors will be polished aluminum. The interior walls, columns and floors of the public space will be finished in Roman Travertine and all railing and other metal fittings will be aluminum or monel metal.

The companies at present using this terminal comprise the Gray Coach Lines, subsidiary of the Toronto Transportation Commission, the Toronto Greyhound Line, Collacutt Lines, Colonial Coach Lines and Toronto Bus Lines. The terminal facilities will be rented to the various coach lines. Ticket sales will be handled by the terminal staff on a percentage basis.

Coach movements at present average about 130 per day, with a passenger movement of 2,500. It is anticipated, however, that this will be substantially increased when the new terminal facilities are available, probably about Dec. 15, 1931.

In designing this terminal, the principal points kept in view as desirable were:

1. Through operation for the coaches without the necessity for backing up or maneuvering on the property.
2. Separation of incoming passengers from outgoing passengers. It will be noted that this is effected by means of an iron fence between the arrival platforms and the departure platforms, with separate door to each group.
3. Passenger platforms entirely roofed over to provide protection in all weather.
4. Adequate accommodation for parcel and baggage handling. Baggage will be handed by the passenger through the wicket between the waiting room and the baggage room, where it will be checked and delivered to the driver or baggage porter at another wicket leading in to the drivers' reporting room and thence conveyed direct to the departure platform.
5. Restroom and lavatory accommodation for drivers and mechanics separate from public facilities.
6. Parking accommodation for coaches making short stopovers.
7. Covered inspection and servicing facilities for coaches, located as far as possible from the passenger loading area.
8. Reservation of as much area as possible in the building for rental to concessions and stores.

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Cost of Fuel for Auxiliary Services Reduced 27 Per Cent

Study of fuel consumption for heating offices, shops, carhouses, substations, etc., of the Montreal Tramways has resulted in substantial savings

By **F. A. COMBE**
Consulting Fuel and Steam Engineer
to Montreal Tramways

HOW substantial savings can be effected by special attention to the operation of auxiliary services is shown by the results of a study of the fuel and heat consumptions and costs at the various plants, offices, shops, carhouses, substations, etc., of the Montreal Tramways. With the assistance and advice of a fuel and heating specialist acting in co-operation with the company's officials and staff, a concerted effort was made to reduce costs of this kind during the past winter. Without any expenditure for new equipment and with but minor changes made to grates and furnace settings by the company's maintenance department to permit the use of different fuels, the reduction in fuel costs for the winter season of 1930–1931 amounted to nearly $15,000. or 27 per cent of the previous figure. An incidental benefit has been the almost complete elimination of smoke.

Efficiency and economy in the burning of fuel and usage of heat is dependent, to a great extent, upon the personal element rather than the design of equipment. Even with the best selection of fuel, boiler settings and heating systems, much must depend upon the "man behind the gun," in the regulation of supplies, supervision of operation and use of steam, heat and power.

Comparison of Fuel Costs 1929-1930, and 1930-1931

	1929–30	1930–31	Saving
Carhouses	$32,724.77	$24,239.10	$8,485.67
Youville shops	11,704.00	8,684.00	3,020.00
William Street garage	3,399.50	2,393.79	1,005.71
Substations	3,156.54	1,963.30	1,193.24
Ticket offices	1,998.70	1,376.85	621.85
Yard buildings and shanties	2,257.89	1,761.32	496.57
	$55,241.40	$40,418.36	$14,823.04

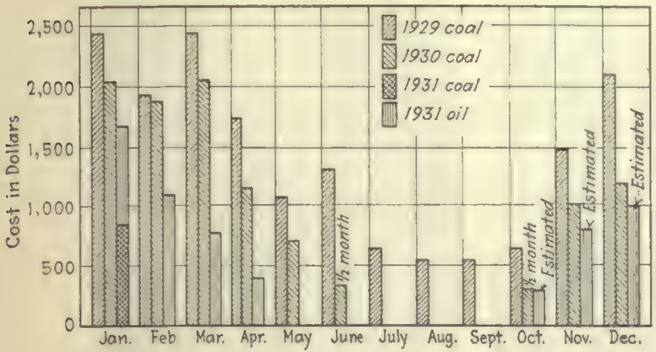
NOTE: The average outdoor temperature in Montreal for the heating season, from Oct. 1 to April 30, was 31.5 deg. F. for 1929-1930, and 33.2 deg. F. for 1930-1931—a difference of 1.7 deg. F.

In this campaign, the general storekeeper, acting in collaboration with the consulting engineer, was entrusted with the supervision and regulation of fuel supplies to the different heating plants and the utilization of the cheaper fuels in substations, offices and small buildings. The chief operating steam engineer was responsible under the consulting engineer for the operation of the main steam station and boiler plants. Care was taken by the carbarn superintendents and those in charge of offices and buildings in the regulation and use of steam and heat.

At four of the six carhouses, and at the Youville shops, the heating plants are old, with horizontal return-tubular boilers set low and hand fired. The fuel used in the past was bituminous r.o.m. coal alone, or mixed with anthracite screenings. These boiler plants, although not efficient, are typical of the large majority of heating plants in general use on the property. The two other carhouse boilers are fired with fuel oil.

The fuel was changed to coke breeze mixed with bituminous slack at three of the coal-fired carhouse boilers and at the William Street garage, with modifications to the grates where necessary. No change was made to the oil-fired boilers, nor in the fuel for Youville shops and one carhouse, as extensive remodeling was under consideration at these plants.

The boilers at the Youville shops which are worn out are being replaced this summer by a modern oil-fired boiler plant. It is planned also to change the grates to burn coke breeze at the remaining carhouse. With these and other modifications, overhauling, and oil delivery cost reductions, it is estimated that a further saving will be made next heating season in excess of $7,000, making a total reduction of 40 per cent on past years fuel cost.



Fuel costs of stand-by service at Hochelaga Power House have been reduced from $16,892 in 1929 to $10,702 in 1930 and an estimated figure of $6,000 for 1931

In the substations, ticket offices and small buildings, a change in fuel from the high-priced grades of anthracite previously used to a lower priced coke was made wherever possible. This change was made by trial during the course of the heating season, and will be made more general next winter as the operators become accustomed to its use. Many of the savings made with the smaller furnaces were due to careful supervision and instruction irrespective of change in fuel.

An example of one of the minor items, not included in the foregoing figures, was saving made in heating of domestic water for the company's head office building. During the summer months when the steam heating system is not in service, water for lavatory and washing purposes had been heated by an automatic gas heater costing about $100 per month. A jacket heater was installed to burn a small grade of anthracite in place of the gas heater, with the result that the cost has been reduced to about $20 per month.

The Montreal Tramways uses hydro-electric power entirely for the ordinary operation of their system, with a steam station for partial stand-by service held in reserve. Last summer, the steam plant was closed down for three months during the time when the chance of interruption to the hydro power would be remote. In order to reduce the banking fuel charge when the station was in reserve service, two of the smaller boilers in the plant were changed over to burn fuel oil with booster oil burners installed under two of the large coal-fired boilers to enable steam to be raised quickly in case of emergency.

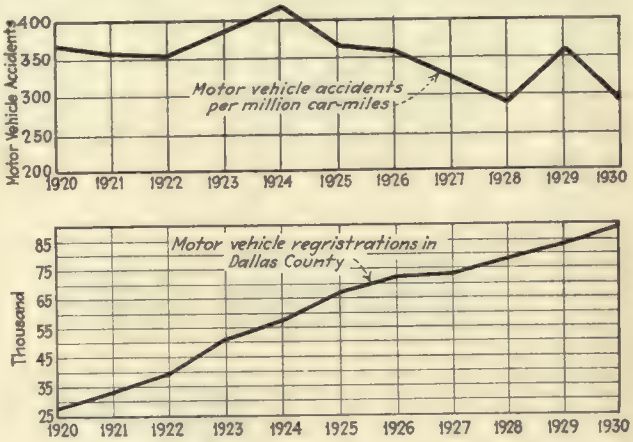
As a result of these changes, together with other operating economies, the fuel cost for the year 1929 was $16,892, for 1930 $10,702, and for the present year (partly estimated) it will be around $6,000.

A study made of the possible utilization of off-peak hydro-electric power shows that under the conditions existing on this system, it would be profitable to install electric steam boilers in conjunction with oil-fired boilers at some plants of higher steam pressure, and to use electric boilers or heaters with steam or liquid storage accumulators at other points as best suited to the local requirements and where conditions are favorable.

At the Youville shops, where power lines and sufficient transformer capacity is available, the cost of installation of an electric boiler with connections would be approximately $9,500, and it is estimated that the saving resulting from its use in conjunction with the new oil-fired boilers would amount to $3,550 per year. With a deduction of 14 per cent for fixed charges on the investment, this leaves a net clear saving of $2,220 per year. The selection of new boiler equipment being installed this summer has been made to suit such a combination with electric steam generation, but it is not proposed to install the electric boiler at the present time.

Many other opportunities exist for savings and economies in the auxiliary services of fuel, power and heat. Improvements to and tuning up of the heating piping systems and method of heat supply are being taken care of steadily without big expenditures. The policy is to work forward step by step. Each step taken in the way of major boiler replacements, new equipment or change to fuel oil, as at the steam stand-by station and some carhouse plants, is in line with a definitely considered final plan.

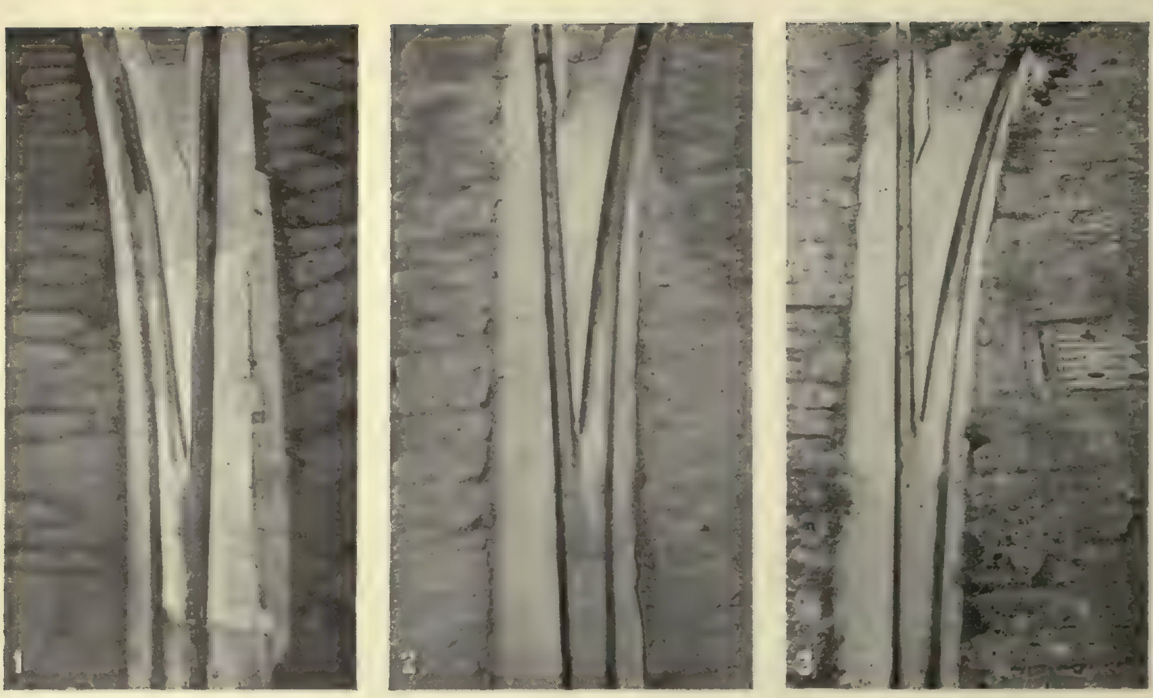
Accidents Reduced with One-Man Operation at Dallas



Accidents have been reduced at Dallas despite higher operating speeds and a large increase in motor vehicle registrations

HIGHER speed of street cars with fewer motor vehicle collisions is shown in the ten-year record of the Dallas Railway & Terminal Company, in spite of a tremendous increase in motor vehicle registrations. As approximately two-thirds of the car-miles are operated by one-man cars, this is another demonstration of what can be accomplished with cars of this type. The purchase of safety cars of both the Birney and Peter Witt types has played an important part in this record. Double-truck, two-man cars have also been rebuilt for one-man operation in the shops of the company. A comprehensive program of track rehabilitation and regular maintenance has been carried on and equipment is consistently maintained.

It is a notable fact that this achievement is not the result of specific safety campaigns so much as it is the result of care shown in selecting and training operators. Constant vigilance is exercised by the management and drastic action follows when there is a violation of rules.



Results of Wear on Open-Point Mates in Cleveland

1. Cast-steel, keyed-in, hard-center mate which was placed in service in Cleveland April 27, 1914, the photograph being taken Feb. 2, 1931. This mate is designed with the long floor tapers, which practice has been discontinued. During the time it has been in service, the operation over the straight run has been practically negligible, being limited to occasional work train operation or relatively infrequent emergency rerouting. As nearly as can be determined, the curved run has carried approximately 4,525,000 wheel passes, while that over the straight run has only been about 20,000 wheel passes. It has never been welded and, so far as can be determined, has never been ground.

2. Mate with present standard floor depths and tapers. This was installed on May 21, 1928, the photograph being dated Jan. 22, 1931. At the latter date, the straight run had carried approximately 1,866,000 wheel passes, while the curved run had carried only about 7,800 wheel passes.

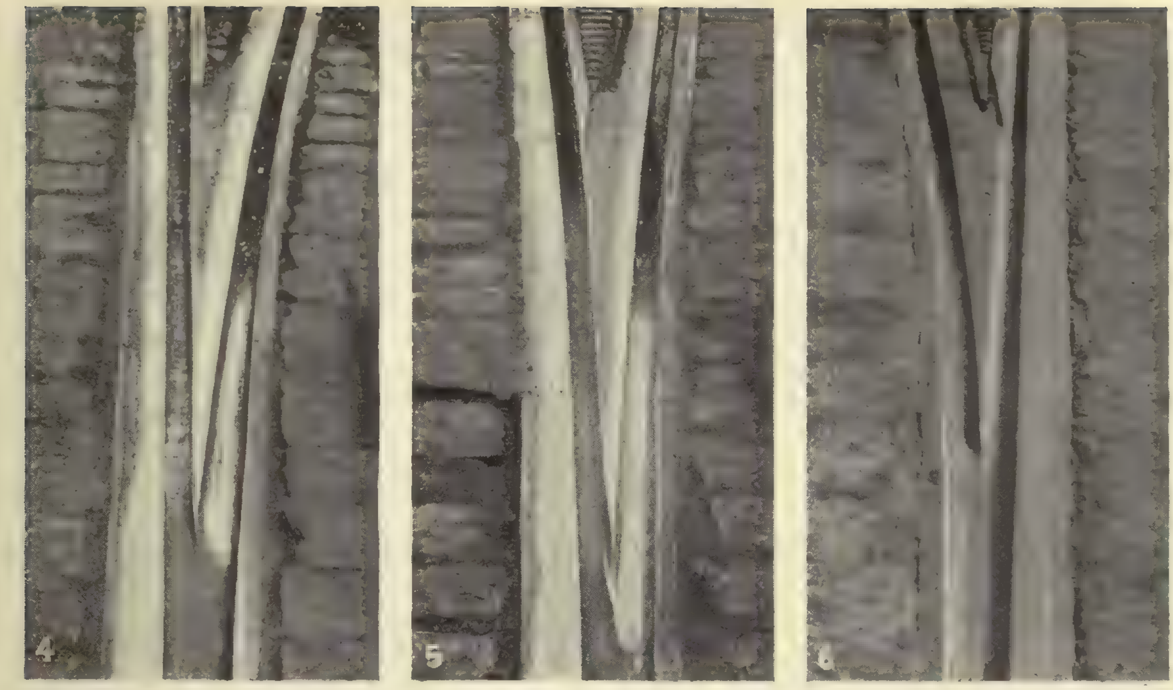
3. Another mate in the same layout as that shown in Fig. 2, and installed at the same time, but where there has been a more uniform distribution of car movements between the curved and straight runs. In this instance the straight run has carried about 548,000 wheel passes, while the curved run has carried approximately 342,000 wheel passes

Flange and Tread Wear on Open-Point Mates

By **H. H. GEORGE**
Superintendent of Way
Cleveland Railway

PROBLEMS of maintenance arising from flange and tread wear on open-point mates or open-point switches have always been more or less troublesome. The problem is more serious where car movement predominates to a marked extent through one run with only occasional operation through the other. If such occasional operation is confined to emergency rerouting, it quite often happens that grooves worn by the wheel flanges in the mate floor have progressed to the point where the wheels will not take the opposite run, in which event serious delays may result.

It has been customary to provide either a level flange-bearing floor through both the straight and curved runs past the mate point, or a floor-level in the straight run only slightly below the flange-bearing level in the curved run, easing these off by means of various tapers to the full groove depth in each direction. There has been considerable variation in the distance that the respective floor levels have been carried in each direction from the mate point before starting to taper down to full depth of groove. Every street railway maintenance engineer knows that where the original design provided initial flange bearing through both curved and straight runs, and operation predominates through the straight run, it is only a short time before an appreciable groove is worn in the floor of this run. If the normal maximum traffic is through the curved run, then the wear is in the form of a double groove in the mate floor in the curve, the front-wheel flange cutting a groove close to the gage side of the rail, while the rear-wheel flange cuts its



Results of Wear on Open-Point Mates in Cleveland

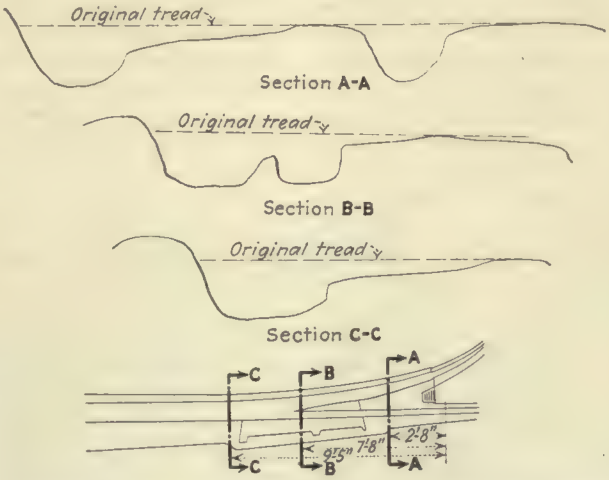
4. Mate at another location in Cleveland where the distribution of wheel movements has been in a somewhat different ratio. This mate was installed on May 14, 1929, the photograph showing the condition as of Jan. 25, 1931. In this instance, the straight run has carried approximately 1,850,000 wheel passes, while those through the curved run equal about 785,000 wheel passes.

5. A 20-ft. equilateral mate where the traffic distribution through the two runs has been practically uniform. This mate was installed Sept. 30, 1918, the date of the photograph being Feb. 2, 1931. The right-hand run in this case had carried about 1,040,000 wheel passes, while the left-hand run had carried about 1,200,000 wheel passes

6. Mate under traffic confined almost entirely to the straight run. This was installed Nov. 2, 1924, the photograph being taken on Feb. 25, 1931. During this time, the straight run has carried approximately 6,850,000 wheel passes. The movements over the curved run have been limited to an occasional work train or a rather infrequent emergency rerouting

groove close to the guard side. As flange wear progresses on the guard side of the switch tongue opposite the mate, the rear wheel flange will gradually tend to wear down the ridge between the two grooves, while the front wheel flange will gradually widen the groove next to the gage. The characteristic wear will, of course, vary with the wheel contours and diameters, as well as with the varying relation between the track gage and truck wheelbase, but the condition described will be found in a modified form in every instance where the operation is of the kind mentioned.

As flange wear develops in the floor leading to the curved run, flange bearing finally disappears entirely and tread bearing comes into play, with the wheel treads gradually cutting into the top of the mate as the width of tread bearing is gradually decreased by reason of the wheels moving over into the curve. On some properties, an attempt has been made to improve conditions by making the mates flange-bearing through the curved run only. Various means are used to accomplish this, differing principally in the distance ahead of and back of the mate point that the flange bearing is continued, and also as to the taper used to run off this flange bearing area.



Wear profiles of various sections through mate with long floor tapers shown in Fig. 1

A number of years ago, the Cleveland Railway began some experiments with a mate design where flange bearing was provided in the curved run only. This flange bearing was curved well ahead of the mate point, and was tapered off to meet the floor level in the straight run by means of a long taper, which brought the two floor levels together well out in the straight run. While this was an improvement over the old practice of flange bearing in both runs, it was still found that, when the heaviest traffic followed the straight run and head wear progressed, it was only a short time before a groove began to develop in the straight run floor, and that grinding or welding had to be resorted to in order to operate through the curve. Where the heaviest traffic was through the curve, the double groove previously referred to made its appearance much sooner, and because the two floor levels came together well out towards the straight run, car operation through the opposite run was affected much sooner. It was recognized that this feature of the mate design was responsible for the rapid flange wear.

After a thorough trial of this design, it was decided to carry the experiment still farther by shortening the length of the level floor in the curved side ahead of the mate point and also by appreciably shortening the distance in which this flange-bearing floor level was tapered down to the level of the floor in the straight run. The level in the mate floor in the curved side was ended opposite the $\frac{3}{8}$-in. point, the depth of groove in the raised floor section of the curve being $\frac{1}{2}$ in. or $\frac{1}{8}$ in. less than the flange depth. From the $\frac{3}{8}$-in. mate point, this flange bearing in the curve was tapered down to the $1\frac{1}{16}$-in. depth of floor in the straight in a distance of $5\frac{1}{2}$ in. The $1\frac{1}{16}$-in. floor depth in the straight was determined by adding $\frac{3}{16}$ in. to the $\frac{7}{8}$-in. depth of the interurban flanges. The flange bearing level in the curved run was continued back of the mate point for a distance of $19\frac{1}{2}$ in., and was then tapered down to the $1\frac{1}{4}$-in. groove depth of the rail section in a distance of 3 ft. The $1\frac{1}{16}$-in. depth in the straight run was continued for a distance of 17 in. ahead of the point where the taper from the curved run ended, and this was then tapered off to the $1\frac{1}{4}$-in. groove depth of the rail section in a distance of 15 in.

This design is proving very satisfactory. In no case has it been found necessary either to weld or grind any of these mates during their period of service. A careful inspection in the field shows that we could either reverse the direction of operation or could change the operation to the opposite run without the slightest risk of derailment and without the necessity for any welding or grinding.

Mercury Rectifier Substation Operates on 25 or 60 Cycles

By **R. D. BRACKETT**

Transportation Engineering Department
General Electric Company

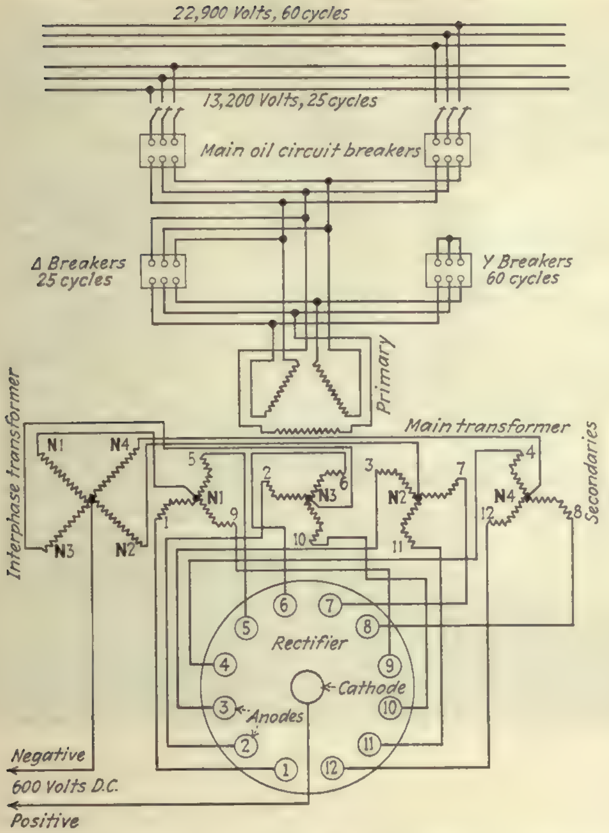
VERSATILITY of the mercury vapor rectifier is seen in its adoption by the Eastern Massachusetts Street Railway for use on either a 25-cycle or a 60-cycle alternating-current circuit in its Fall River substation. The installation is unusual in that power may be furnished either from the 13,200-volt 25-cycle system of the railway or from the 22,900-volt, 60-cycle system of the Fall River Electric Light Company. The rectifier operates equally well on either frequency, and the transformers were designed to give successful service on either frequency at about the same cost as standard 25-cycle transformers. In the present instance, the numerical relation existing between the two voltages made it possible to transfer quickly from 25 cycles to 60 cycles by disconnecting the high-voltage winding of the main transformer and changing from a delta to a Y connection. Since the control power frequency is also changed, some of the rectifier auxiliaries must be changed over by a double-throw lever switch in the control circuit. Each of the three rectifier equipments forms a complete independent unit, consisting of the rectifier tank and auxiliaries, main transformer, interphase transformer and manual switchgear equipment. The main connections are shown in the diagram. The substation installation also includes a bake-out transformer, bake-out resistor, resonant shunt, direct-current negative reactor and 25-cycle and 60-cycle single-phase auxiliarly power transformers as part of the rectifier equipment.

The three mercury arc rectifiers are each rated 1,000 kw. at 600 volts. They are General Electric Type RDW twelve-anode tanks. They are of standard construction, and carry the standard railway load guarantees of 150 per cent load for two hours followed by 200 per cent load for one minute. Direct-current excitation for each rectifier is furnished by a 60-volt, $\frac{1}{2}$ kw., d.c. generator direct connected to both a 25-cycle and a 60-cycle, 220-volt single-phase motor. The rotary vacuum pump also has two separate motors.

Main and interphase transformers for each rectifier are of the oil-immersed, self-cooled outdoor type. The main transformers are each rated 1,065 kva. nominal, 13,200/22,860 volts. Both ends of each phase of the high-voltage winding are brought out so that either delta or Y connection may be made at will. Four taps approximately $2\frac{1}{2}$ per cent below normal for full kva. capacity with ratio adjusters are provided in the high-tension winding. There are four low-voltage windings, each of one-fourth capacity, arranged quadruple zig-zag for twelve-phase connection to the main anodes. The four neutrals are brought out for connection to the interphase transformer.

The resonant shunt consists of six resonant circuits tuned to trap the interfering harmonic frequencies. Each of these circuits is made up of an inductance in series with a capacitor, connected between the positive bus and the negative bus on the rail side of the d.c. negative reactor. Since the rectifiers operate on 25 or 60 cycles, three of these tuned circuits are provided for each. For 25 cycles they are tuned for 300, 600 and 750 cycles, or the twelfth, 24th and 30th harmonics, and for 60 cycles they are tuned for 360, 720 and 1,080 cycles, or the sixth, twelfth and eighteenth harmonics. By proper design of the six inductance coils it is possible to use the same set of capacitors on either frequency, so the change-over may be made with a triple-pole double-throw lever switch.

The three d.c. rectifier switchboard panels are standard, as are the d.c. feeder panels. The auxiliary control equipment for each rectifier is located on the a.c. and d.c. auxiliary panels. The switchgear equipment is for manual operation, although there is provision for automatic control of the anode heaters after the control switch is closed and the rectifier is in operation, and



Comparatively simple connections make it possible to operate the Fall River substation at either 25 cycles or 60 cycles

for automatic control of the rotary oil-seal vacuum pump by means of the vacuum regulating equipment. Special equipment on these panels includes 25-cycle and 60-cycle underload relays to control the anode heaters, 25-cycle and 60-cycle auxiliary anode heater contactors, and 25-cycle and 60-cycle auxiliary contactors for the rotary vacuum pump motors.

A separate control transfer panel carries a four-pole double-throw lever switch and four fusible cutouts. In one position this switch connects the 220-volt side of the 13,200-volt, 25-kva., 25-cycle, single-phase auxiliary transformer through fuses to the 25-cycle or 60-cycle common control bus and the 25-cycle control bus. In the other position it connects the 220-volt side of the 22,900-volt, 25-kva., 60-cycle, single-phase auxiliary transformer through fuses to the 25-cycle or 60-cycle common control bus and the 60-cycle control bus.

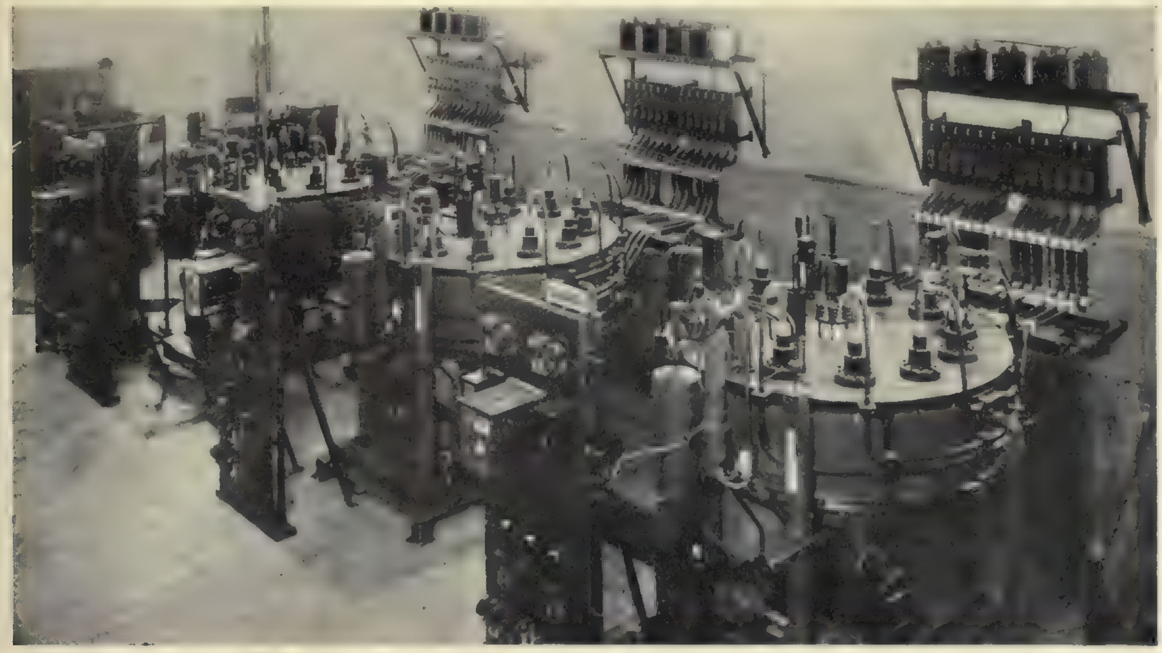
Three 60-cycle and three 25-cycle a.c. transformer and rectifier panels are located alternately beginning at the left end in the steel a.c. switchboard. Upon each are mounted ammeters, watt-hour meters, overload relays and twin pull-button control switch.

Since the 60-cycle system has a grounded neutral there are three overload relays for the 60-cycle panels. The 25-cycle system is not grounded, so there are only two overload relays.

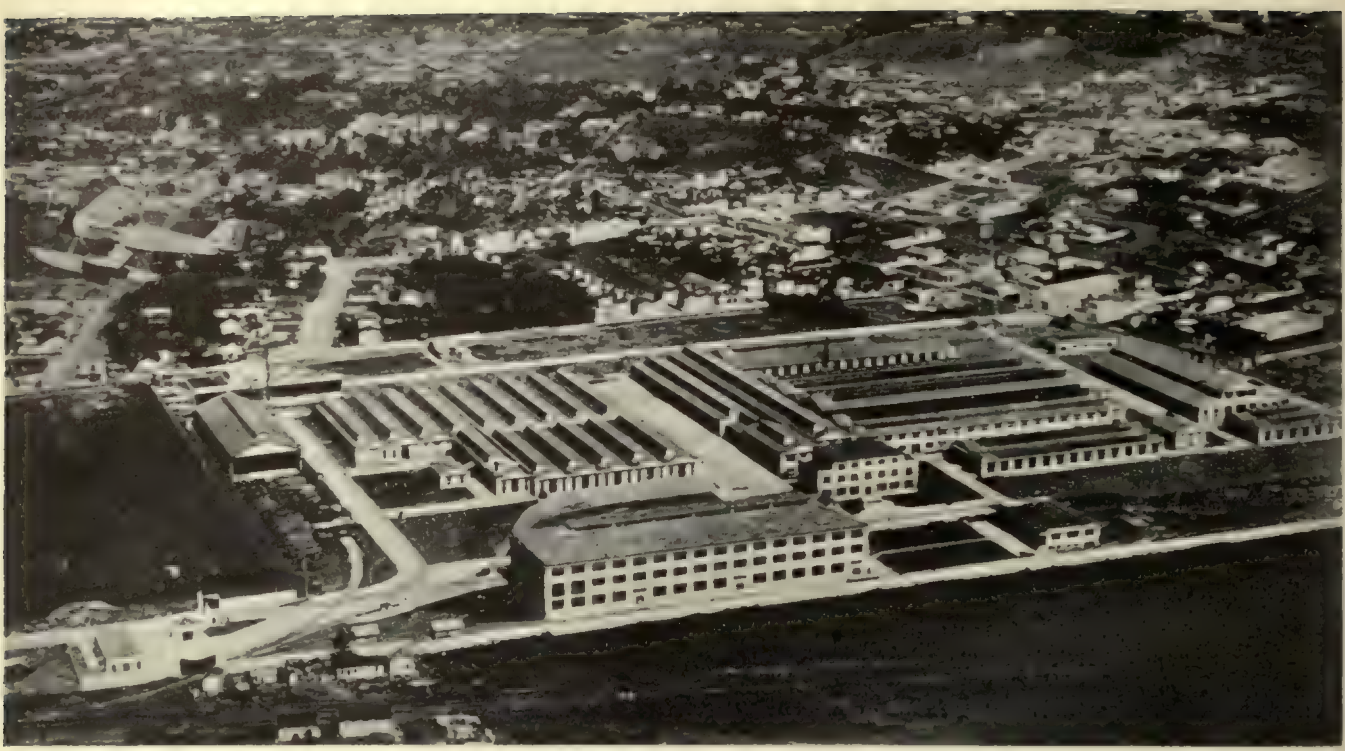
Each of the rectifier equipments has four oil circuit breakers, consisting of a 25-cycle and a 60-cycle motor-operated main breaker and two solenoid-operated non-automatic breakers for changing connections. These breakers are electrically interlocked so that when one set of circuits is closed it is impossible to close the other.

Manual control of these rectifier equipments is made simple by means of the different control buses. In addition to the 125-volt, d.c. control bus from the station battery, three separate 220-volt a.c. control buses are provided, only two of which are used at one time. One of these is a common 25-cycle or 60-cycle control bus used on either frequency to supply power through insulating transformers to the mercury condensation vacuum pump heaters and to the anode heaters. The 25-cycle control bus supplies power to the 25-cycle motor of the rotary vacuum pump, the 25-cycle motor of the arc-striking set, and the 25-cycle tungar rectifier used for charging the small 6-volt storage battery which furnishes excitation for the thermal vacuum gage. The 60-cycle bus supplies a similar set of devices.

The main advantages of rectifiers over synchronous converters for this substation are their adaptability to operation on either 25 or 60 cycles, higher over-all efficiencies at the lighter loads, and no noise or vibration.



Standard mercury vapor rectifiers are used without modification



Erection of modern railway shops marks a step in the industrial progress of the Brazilian capital

New Shops *for Rio de Janeiro*

Maintenance and manufacturing activities have been grouped in one extensive plant. Lay-out developed to co-ordinate activities and to secure all possible economies

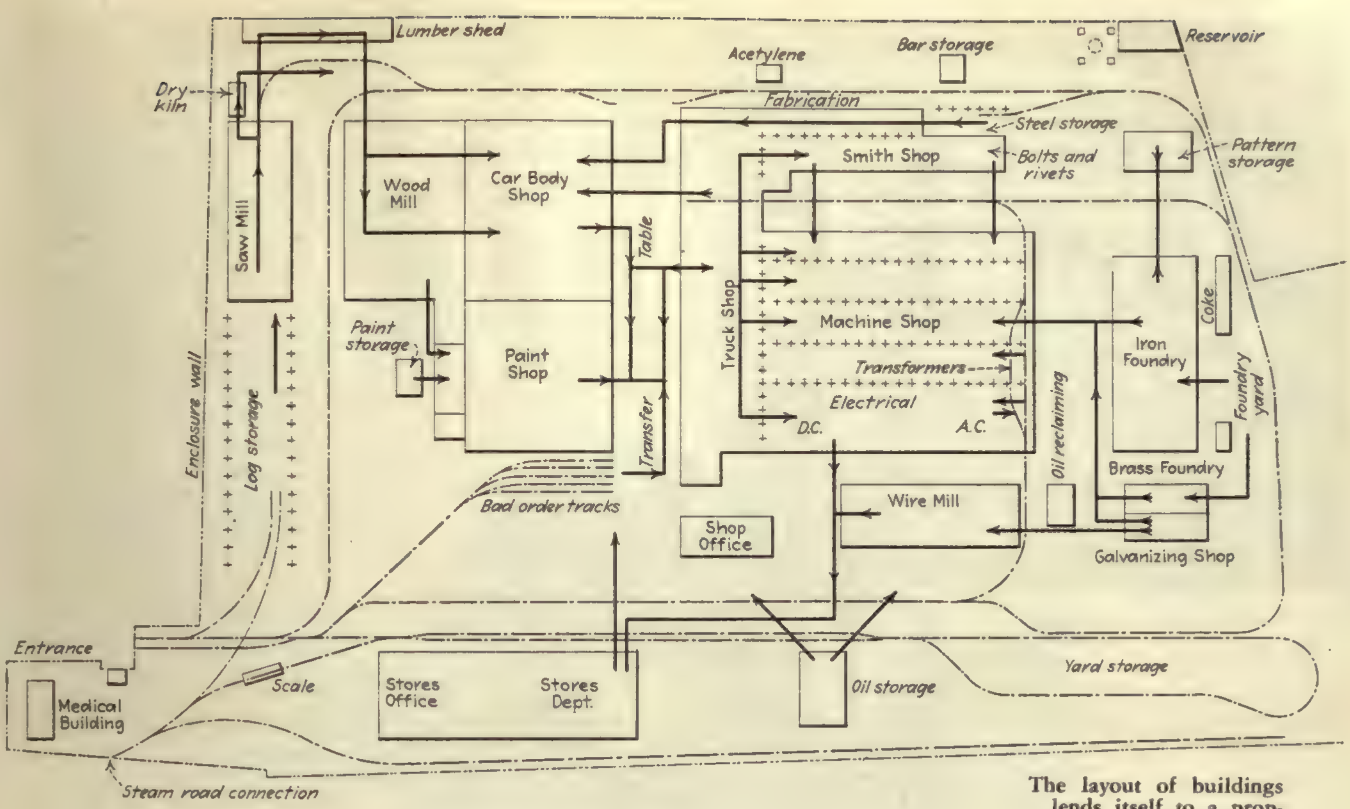
REPAIR and maintenance of cars and buses, and the repair and maintenance of heavy machinery, generators and transformers, as well as the manufacture of many parts of equipment and supplies used by the Rio de Janeiro Tramway, Light & Power Company, Ltd., and its associated companies have been centralized in an extensive new plant. The company controls and operates the public utilities in Rio de Janeiro, including the street railway, bus system, lighting, power, gas and telephone services. The new plant, completed in 1930, was built on 35 acres of land. It was planned for efficient production methods and equipped with modern machinery to meet the demands of the extensive operations of the company and to provide amply for future growth. The stores department, which previously operated at six locations, will also be centralized with its general offices at this new plant.

The new shops were designed and constructed by Dwight P. Robinson & Company of Brazil, Inc., a division of United Engineers & Constructors, Inc., after a careful study, made in co-operation with the company officials, of possible operating economies which could be obtained by centralization of activities. The requirements of the new shops were outlined as follows:

1. Maintenance of 1,000 cars
2. Maintenance of 200 buses
3. Construction of new steel cars and buses
4. Repair and maintenance of heavy machinery, generators, motors, transformers and an exclusive variety of equipment
5. Manufacture of equipment and supplies used by the associated companies
6. A complete mechanical and testing laboratory
7. Centralization of the general stores and stores offices in close contact with the new shops

In the layout of the new shops, including the grouping of buildings, locating the various departments in each building and the arrangement of machine tools and mechanical equipment, every possible advantage was taken to apply the principles of modern production methods to the maintenance and construction of cars and buses, and the manufacture of a great variety of parts and supplies. Studies of the flow of work throughout the plant were made, and particular attention was given to the grouping of buildings and departments so that all work in process would move progressively and rapidly from one operation to the next with a minimum of interference, cross routing or back tracking.

The machine tools and mechanical equipment throughout the plant consist of approximately 700 items, of which 475 are new equipment. All new machine tools are individually motor driven, and embody the latest



The layout of buildings lends itself to a properly co-ordinated system of production control

Planned and Equipped to

Reduce Costs

improvements and time-saving devices. The grouping of the machine tools was determined by the character of the work. Where processes are continuous, the tools are arranged in a continuous line; where the work is varied, as in the general machine shop, machine tools are grouped by kinds, such as lathes, drills, milling machines, etc. Ample space has been made available for additional tools of like kind in their respective groups.

Careful consideration was given to the movement and handling of raw material and work in process. Service tracks reach all parts of the yard and extend into several departments. Siding connections with narrow and standard-gage steam railroads are provided for the stores department and the log storage yard. Several departments are equipped with overhead cranes, jib cranes or monorails. A fleet of storage battery lift trucks is used for the movement of material throughout the plant; these are supplemented by hand-lift trucks for handling work in process. All departments have spacious aisles to permit rapid and easy handling of material in or through the departments. All buildings of the plant are connected by concrete-paved roadways.

The buildings were designed for

Machine shop for car and bus repairs. On the mezzanine floor is the sheet metal shop

Special equipment is installed in the wood mill to handle the native hard woods

At right — The non-ferrous foundry has three 200-lb. electric crucible furnaces

a tropical climate, providing ample ventilation and light, but shutting out as much as possible the direct rays of the sun. This was accomplished by the use of saw-tooth roof construction on the one-story buildings, with vertical glass facing south or east. Most of the shop buildings are one story high, with structural-steel frames. The inclosing walls consist of reinforced-concrete base walls surmounted by brick walls, having stucco on the outside and plaster on the inside. All floors are laid on a base of reinforced concrete. The concrete floor bases in the machine shop, truck shop and galvanizing building are surfaced with treated wood blocks to resist the heavy wear and trucking in those departments. In the saw mill, wood mill, car erecting shop and wire mill, floors are surfaced with asphalt. In all other departments, the floor base is surfaced with a cement finish.

The roofs of the shop buildings, having a slope of 4½ in. in 12 in., consist of precast interlocking cement tile supported directly on the steel purlins. The storehouse, oil storage, pattern storage, medical building and gate house are of reinforced concrete construction.

Most of the new tools are driven by individual motors on a 220-440 volt, three-phase, 50-cycle power circuit. Group drive through shafting was used in some cases. The machine tools in the old shops were driven by motors on a 220-volt, three-phase, 50-cycle power circuit. As it was planned to transfer the more modern machine tools to the new shops, a study was made of the relative economy of 220-volt and 440-volt operation. The use of 440-volt power was found to be lower in first cost and more economical. It was, therefore, decided to adopt 440 volts for the new shops and to rewind the old 220-volt motors which were transferred from the old shops. The hazard of the higher voltage was eliminated by grouping the control equipment out of reach of the machine operators.

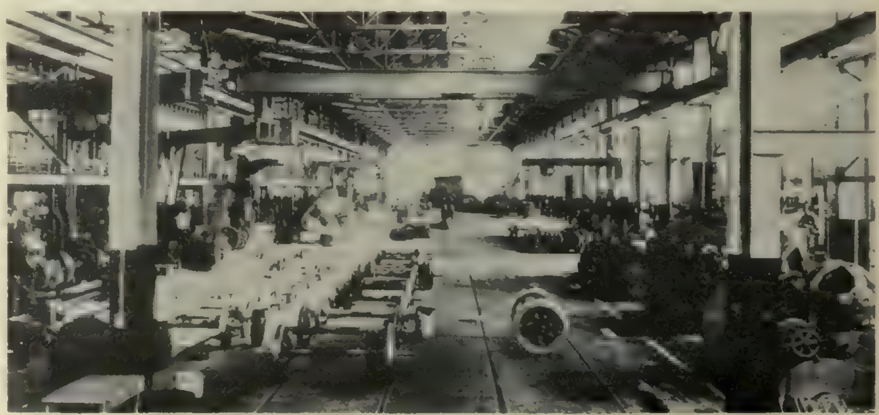
Power Supply and Distribution for Shops

The electrical installation consists of two incoming 6,000-volt lines and four outgoing feeds to the power and lighting transformers, fire pumps and high-tension testing department. The main switchboard is divided into three separate sections, one for 6,000 volts, one for 440 volts and one for 217-125 volts for lighting. The high-tension board controlling the duplicate incoming 6,000-volt lines is separated from the low-tension board by a fireproof wall. Both the incoming 6,000-volt feeders and the low-tension feeds are lead-covered and run in underground ducts.

The high-tension board is equipped with heavy-duty oil circuit breakers and hand-operated rear-mounted disconnecting switches. The low-tension power and lighting boards are divided into two groups facing each other. This compact arrangement permits lining up the switchboard with the bank of outdoor transformers. The substation is located close to the load center of the group of shop buildings.

The fire-pump motors take their power from a third independent 6,000-volt overhead feeder which does not enter the shop. This power is stepped down to 440 volts through step-down transformers. With a connected power load of approximately 5,000 kva., the new load factor was estimated to be 30 per cent as compared to the observed load factor of 27 per cent in the old shops. The connected lighting load is 800 kva., and provision was made for a load factor of 75 per cent. The entire electrical installation was made in accordance with the National Board of Fire Underwriters' electrical code.

Following the policy of the company to provide



All machine tools in the wheel and axle shop are served by jib cranes or by the large overhead crane attractive working conditions for the employees, the equipment of the plant includes a medical dispensary with a first-aid room and a doctor in attendance, who also prescribes for the families of the employees. Cafeterias with complete kitchen equipment were installed for furnishing luncheons at low cost to the workmen. The locker rooms are equipped with individual lockers of precast reinforced-concrete slabs. Circular wash fountains and shower baths have been placed in all buildings. Washrooms, toilets and drinking fountains are placed at locations easily accessible from all parts of the shop. Floors and walls of the locker rooms are finished in tile so that they may be cleaned readily as an aid to sanitation.

ROUTING WORK IN CAR MAINTENANCE AND REPAIR

In car repairs and scheduled overhauling, cars enter the truck shop by way of the transfer table, where the car bodies are raised by hoists and the trucks removed directly to the truck repair stand. The car bodies are then lowered on dummy trucks and pass across the transfer table to the car repair shop for body repairing. From there, the cars are taken to the paint shop for cleaning and painting, and are returned to the truck shop, where they are placed on the repaired trucks. The truck shop is two bays wide, having sixteen tracks in the first, or outside, bay. Five of these tracks are equipped with car body hoists. The floor in this section is 18 in. below the top of the track rails to permit easy access to the equipment under car bodies. Four tracks are equipped with drop pits, and one with a car body straightener. A sandblast room is located in one corner of the truck shop.

Five tracks in the truck shop are equipped with car body hoists

Trucks removed from the car pass into the second bay, where they are placed on stripping stands by a 10-ton crane. Stripping is done by jib cranes with electric hoists. The motors are removed and passed to the motor-overhauling section. Mounted wheels pass through the wheel and axle shop, closely adjacent to the stripping stand, where all wheel and axle work is done. Trucks are cleaned and dip-painted in tanks located near the stripping stand.

Wheels with badly worn flanges pass to the welding section of the smith shop, where the flanges are built up by automatic electric welding machines. Badly worn journals are similarly built up. The parts are then annealed in a car-type annealing furnace and returned to the wheel shop for machining. Worn or damaged miscellaneous car and truck parts are repaired in the welding shop, which is equipped for both oxy-acetylene and electric welding.

Air-brake equipment is removed from cars in the truck shop and transported to the air-brake overhaul department, where air compressors, cylinders, valves, etc., are reconditioned and tested and then returned to the truck shop. The equipment and facilities in both the air compressor overhaul section and the air-brake department are arranged in a straight line for progressive operation.

The wheel and axle shop is equipped with two wheel lathes, two journal-truing lathes, two wheel borers, an electric tire heater, two wheel presses, an axle centering machine, an axle straightener, two Lo-Swing axle lathes with multiple tools cutting simultaneously, an axle grinder and a wheel grinder. All of the above equipment is of the heavy-duty, high-production type, arranged for a minimum handling of material between operations. All tools are served by jib cranes or an overhead crane.

The motor overhaul section is equipped with facilities for overhauling and testing motors. Housings are removed from the motor frames and pass to the bearing press where the bearings are removed. The armatures pass directly to the armature overhaul section of the electrical repair shop, where they pass progressively through the following operations: cleaning, stripping, rewinding, banding, baking, commutator turning, smoothing and slotting. The armature baking ovens, which are of the latest type with full automatic heat control, are in a fireproof room located in the production lines. In this room are also located the coil-impregnating tanks and the varnish tanks for dipping armatures. Armatures when rewound are returned to the motor overhaul section where they are assembled and put on test. The coil winding department supplies new armatures and field coils when needed, and repairs controllers, circuit breakers, switches, brush holders and other items of electrical equipment.

All machine work for car repair is done in the south end of the light machine bay, adjacent to the truck shop. This department is fully equipped with suitable machine tools and assembly benches. A well-equipped sheet metal shop is located on the mezzanine floor in the light machine bay. On this floor are also located the trolley bow repairs, fare register and coin box sections.

When car bodies are delivered to the car repair shops, the controllers and other items of electrical equipment, fare registers, curtains and trolley bows are removed from the cars and delivered to their respective departments for replacements or repairs. Car body repairs are expedited by keeping reasonable stocks of standard wood body parts, storage for which has been provided in the car body shop. Parts not carried in stock are quickly obtainable from the wood mill. The curtain and upholstery shop is located on a mezzanine in the wood mill.

When body repairs are completed, the cars are transferred to the paint shop, which is equipped for either brush or spray painting. All cars, however, are brush painted as they are of the cross-bench open type. Buses are spray painted with Duco in a room equipped with the latest ventilation system. Spray booths are provided for painting miscellaneous parts of cars and buses. Paints are stored and mixed in a separate building adjacent to the paint shop.

The company operates approximately 200 buses, including single and double-deck types. While the buses are maintained at the company's main garage, the manufacture of replacement parts and repairs to various units are done at the new shops. Part of the output of the general machine shop is for motor, transmission, drive and other miscellaneous bus parts. Included in the equipment for doing this work are milling machines, broaching machines, gear hobbers, automatic turret lathes, etc. The electrical repair shop does all the repair work for the starting, lighting and ignition system. The sheet-metal shop supplies miscellaneous body parts; this department is equipped with special tools for automobile and bus body work, including a Crown rolling machine for forming bus fenders. The forge shop, foundry and electroplating departments also devote a portion of their activities to the maintenance and repair of buses.

The saw mill supplies lumber for the shop and for other requirements of the system. Logs are received in the log yard either by truck, steam railroad or service cars. They are unloaded and stored by overhead cranes which, in turn, deliver them to the handsaws. Finished lumber from the saw mill passes either to the lumber storage shed or to the wood mill. Dry kilns are provided for drying lumber. The lumber destined for outside use is loaded directly from the saw mill or lumber storage shed into trucks or cars for delivery.

The wood mill is equipped with the latest type of machinery, specially selected for working the native hard woods. Shavings, sawdust and wood refuse from the wood mill and saw mill are collected by an exhauster system and used as fuel in furnishing steam to the dry kiln and for other shop uses.

Close by the machine shop, but in a separate section of the building, is the forge and steel shop, which, in addition to equipment for maintenance work, is equipped with bolt, nut, rivet and nail making machinery. Heat-treating and annealing furnaces are used in the manufacture of car and bus springs and the heat treatment of special steels for miscellaneous parts. This shop is equipped to fabricate steel underframes and superstructures for new cars. The shop also fabricates parts for steel transmission towers, and other miscellaneous structural steel work.

In the layout of the machine shop, an effort was made to segregate maintenance and manufacturing activities; the maintenance work is confined to the south end close to the truck shop, while manufacturing work occupies the north end. The machine shop is divided into bays for light and heavy work. The bay devoted to the heavy work is served by a 30-ton crane, while the other bays devoted to lighter work are served by 5-ton cranes.

The foundry department is divided into two sections, one for iron castings and the other for non-ferrous castings. The output of the iron foundry ranges from brakeshoes to machine castings, and, at times, includes ornamental iron work such as street light posts. The equipment includes one No. 6 and one No. 3 cupola with positive pressure blowers, sand-mixing equipment, molding machines, sandblast cleaning equipment and a complete core-room equipment.

The brass foundry is called upon for brass, bronze and aluminum castings of different compositions, for car and bus, and machine and electrical purposes. The equipment in the brass foundry includes three 200-lb. electric crucible furnaces, molding machines and accessory equipment.

Transformers and alternating-current electric equipment are repaired in the opposite end of the shop in which the car maintenance work is done. Transformers to be repaired enter the north end of the heavy machine shop on cars, where they are handled by a 30-ton overhead crane. The old oil is drained before the transformers are repaired, and dried in electrically heated ovens. After testing, the transformers are refilled with oil and returned to service. The old oil is piped to the oil purification building. The purified oil is pumped directly from the oil storage building to the test stand in the repair shop.

The stores department, which is separated from the shop buildings by a fence, replaces the several stores previously located in different parts of the city, and brings them together with the general offices of the stores department. It has siding connections with steam railroads and with the tramway tracks. The stores department presents a different problem from that encountered in the United States as the distance from manufacturing centers makes it necessary to carry larger inventories and more complete lines of stock. In this respect, the location at the shops is a desirable feature, as many of the parts manufactured there pass directly to the stores department.

Small Capacity Bus Used at Omaha

For service where traffic is extremely light the Omaha & Council Bluffs Street Railway is using this small-capacity Ford bus. It has seats for sixteen passengers and will carry 30 in rush hours. Operation was commenced Feb. 1 of this year.

Trend of REVENUES *and* EXPENSES

Boston Elevated Railway, Boston, Mass.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June 1930	2,550,775	*3.93*	1,937,134	*3.05*	143,016	*36.53*
July	2,371,152	*5.04*	2,108,071	0.61	*167,529*	*489.94*
Aug.	2,280,322	*7.81*	2,113,183	*1.55*	*274,728*	*163.79*
Sept.	2,470,918	*3.78*	2,091,718	0.52	*59,868*	*200.31*
Oct.	2,811,399	*4.04*	2,157,474	*1.29*	221,188	*31.30*
Nov.	2,579,899	*10.34*	2,066,206	*2.56*	71,150	*77.85*
Dec.	2,850,330	*8.20*	2,178,896	2.24	235,950	*56.62*
Jan., 1931	2,840,159	*8.43*	2,082,456	*6.23*	314,067	*30.56*
Feb.	2,534,828	*8.33*	1,952,032	*5.23*	142,339	*48.27*
Mar.	2,769,564	*7.30*	2,019,081	*4.92*	309,212	*29.08*
Apr.	2,616,188	*7.00*	1,909,176	*7.93*	275,740	*11.45*
May	2,579,265	*8.70*	1,993,753	*4.36*	143,804	*52.47*
June	2,415,179	*5.32*	2,073,560	7.04	*99,815*	*169.79*

Brooklyn-Manhattan Transit System, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	5,070,028	21.64	3,591,743	21.59	776,745	28.77
July	5,003,577	*2.86*	3,608,741	*6.06*	720,302	18.55
Aug.	4,727,623	*4.39*	3,558,841	*6.64*	465,144	*14.91*
Sept.	4,834,251	*2.49*	3,453,431	*4.52*	667,323	6.20
Oct.	5,036,775	*2.58*	3,572,553	*4.22*	758,817	2.78
Nov.	4,769,083	*4.37*	3,366,923	*6.98*	689,470	2.34
Dec.	5,065,484	*2.56*	3,546,963	*4.25*	814,788	2.04
Jan., 1931	4,852,706	*5.48*	3,475,330	*7.01*	674,029	*5.80*
Feb.	4,453,655	*3.79*	3,159,903	*5.96*	583,468	2.40
Mar.	5,028,562	*2.56*	3,475,847	*3.37*	814,360	*4.13*
Apr.	4,969,481	*2.09*	3,458,940	*3.35*	804,235	0.25
May	5,056,779	*3.31*	3,438,037	*4.51*	913,877	*1.64*
June	4,983,112	*1.71*	3,466,384	*3.49*	870,919	12.12

Brooklyn & Queens Transit System, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	1,968,238	*2.41*	1,603,996	*8.02*	257,482	18.78
July	1,917,118	*6.15*	1,603,893	*7.10*	203,433	*4.15*
Aug.	1,827,238	*6.45*	1,595,256	*7.11*	120,864	*8.15*
Sept.	1,887,499	*4.66*	1,564,271	*5.65*	213,728	*2.66*
Oct.	1,922,388	*5.20*	1,597,166	*5.50*	214,924	*7.74*
Nov.	1,820,498	*5.65*	1,522,735	*7.58*	187,822	5.20
Dec.	1,920,463	*4.40*	1,560,950	*6.11*	250,893	6.06
Jan., 1931	1,849,644	*6.18*	1,541,235	*7.58*	197,355	3.02
Feb.	1,704,677	*3.98*	1,416,192	*5.40*	176,217	2.58
Mar.	1,941,078	*1.98*	1,602,862	*2.56*	227,472	1.21
Apr.	1,911,878	*1.29*	1,592,919	*3.11*	208,514	6.86
May	1,980,118	*2.50*	1,585,293	*1.85*	286,334	*7.89*
June	1,942,830	*1.29*	1,609,335	0.34	221,493	*13.98*

Capital Traction Company, Washington, D. C.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	340,623	*5.25*	271,761	*3.80*	40,884	*16.70*
July	306,527	*9.02*	272,490	*4.65*	4,935	*78.13*
Aug.	314,513	*3.48*	268,561	*4.09*	16,103	2.62
Sept.	327,713	*7.06*	268,066	*1.61*	30,259	6.78
Oct.	374,646	1.22	288,351	*1.48*	58,638	17.56
Nov.	346,054	*2.70*	273,481	*1.54*	42,659	*11.05*
Dec.	369,885	*1.77*	274,221	*3.21*	67,651	0.61
Jan., 1931	347,491	*3.06*	280,514	*3.30*	37,705	5.11
Feb.	312,815	*3.47*	252,080	*5.68*	30,521	*1.87*
Mar.	344,191	*2.65*	270,962	*3.86*	43,847	*4.03*
Apr.	366,276	*2.39*	273,436	*5.89*	65,123	12.93
May	362,502	*1.87*	281,344	*1.61*	50,959	*6.60*
June	351,017	3.05	276,751	1.84	45,841	12.14

Chicago Surface Lines, Chicago, Ill.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	4.766,687	*6.89*	3,835,838	*4.49*	776,880	*7.48*
July	4,535,460	*10.05*	3,807,075	*7.10*	649,307	*19.05*
Aug.	4,488,146	*12.20*	3,796,705	*8.06*	680,219	*15.82*
Sept.	4,568,564	*9.50*	3,789,472	*4.40*	713,323	*12.94*
Oct.	4,879,570	*10.79*	3,933,416	*7.35*	799,118	*11.69*
Nov.	4,537,647	*13.48*	3,769,538	*6.86*	712,177	*20.77*
Dec.	4,846,000	*8.09*	3,984,572	*9.89*	767,348	*15.67*
Jan., 1931	4,576,133	*12.65*	3,825,964	*5.37*	718,129	*21.00*
Feb.	4,234,704	*10.90*	3,665,038	*6.04*	601,726	*15.44*
Mar.	4,584,224	*4.35*	4,287,237	*5.34*	557,167	15.05
Apr.	4,759,624	*4.46*	4,092,047	0.36	675,629	*11.66*
May	4,541,847	*9.38*	3,802,582	*4.61*	724,514	*12.88*
June	4,348,896	*8.76*	3,629,943	*5.36*	....	......

Department of Street Railways, Detroit, Mich.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	1,787,953	*18.50*	1,511,572	*14.43*	159,027	*46.43*
July	1,549,503	*27.41*	1,452,871	*14.20*	*41,888*	*113.55*
Aug.	1,516,209	*29.02*	1,426,941	*16.67*	*52,773*	*119.46*
Sept.	1,510,161	*26.36*	1,436,175	*12.59*	*51,711*	*115.40*
Oct.	1,579,476	*25.84*	1,458,238	*14.91*	22,933	*91.71*
Nov.	1,481,136	*23.35*	1,333,571	*13.38*	4,890	*98.14*
Dec.	1,610,179	*22.59*	1,440,503	*21.67*	23,052	*77.93*
Jan., 1931	1,550,656	*28.54*	1,421,575	*20.95*	12,759	*91.44*
Feb.	1,431,468	*25.58*	1,323,683	*18.96*	*28,309*	*117.91*
Mar.	1,696,308	*16.58*	1,415,021	*18.68*	133,347	*11.03*
Apr.	1,605,536	*19.51*	1,368,187	*20.82*	101,041	*27.10*
May	1,531,767	*22.42*	1,306,654	*18.75*	75,494	*69.04*
June	1,416,647	*20.71*	1,302,075	*13.86*	*34,977*	*121.99*

Eastern Massachusetts Street Railway, Boston, Mass.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	619,456	*9.64*	435,292	*6.43*	28,672	*58.48*
July	617,220	*10.11*	461,048	7.27	3,926	*91.22*
Aug.	624,332	*9.42*	444,429	*10.33*	28,399	*52.01*
Sept.	612,237	*7.12*	448,470	*0.88*	21,771	*70.76*
Oct.	623,872	*8.48*	467,773	*4.92*	15,811	*76.73*
Nov.	590,856	*10.90*	449,032	*1.60*	205	*97.62*
Dec.	670,964	*11.93*	516,913	1.71	20,841	*84.02*
Jan., 1931	700,961	*7.63*	472,079	*2.88*	36,145	*56.16*
Feb.	639,344	*6.62*	434,904	*2.83*	33,058	*50.86*
Mar.	685,614	*3.63*	472,317	*1.53*	28,982	*81.83*
Apr.	617,705	*5.21*	434,716	*2.59*	9,906	*78.95*
May	629,827	*5.14*	450,887	*0.23*	23,599	*52.14*
June	622,119	0.43	447,131	2.72	5,090	*82.24*

*Decreases or deficits are shown by *italic figures.*

Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	72,865	*15.19*	65,324	*25.80*	*12,940*	*172.80*
July	60,907	*21.02*	64,134	*11.58*	*24,217*	*110.22*
Aug.	64,592	*18.82*	62,484	*8.19*	*12,690*	*36.45*
Sept.	72,267	*11.61*	63,549	*5.42*	*8,497*	*436.09*
Oct.	75,708	*17.80*	66,353	*0.59*	*18,447*	*226.80*
Nov.	72,024	*13.82*	66,314	*0.23*	*21,171*	*158.25*
Dec.	....	.....	....	.....	....	......
Jan., 1931	79,764	*15.78*	67,438	*7.38*	*13,133*	*236.77*
Feb.	74,018	*13.38*	62,239	*7.93*	*13,594*	*75.36*
Mar.	75,201	*7.83*	64,051	*7.61*	*13,965*	[illegible]
Apr.	70,660	*0.48*	62,685	*4.90*	*16.298*	23.64
May	72,560	*8.29*	61,040	*6.82*	*15,996*	*21.34*
June	....	....	....	....	....	......

Galveston-Houston Electric Railway, Houston, Tex.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $* †	Increase or Decrease Per Cent* †
June, 1930	45,659	*20.34*	28,273	*10.93*	*74,054*	*114.30*
July	46,757	*9.65*	29,248	*3.52*	*78,159*	*123.50*
Aug.	47,425	*11.42*	28,402	*8.12*	*82,135*	*146.25*
Sept.	42,823	*16.49*	28,052	*14.83*	*84,893*	*144.43*
Oct.	38,032	*11.56*	27,266	*6.85*	.....	......
Nov.	36,974	*12.49*	44,183	*9.58*	*93,685*	*127.12*
Dec.	36,166	*15.00*	27,949	*1.79*	*99,343*	*112.93*
Jan., 1931	33,291	*20.15*	25,057	*9.18*	*105,000*	*110.59*
Feb.	32,281	*19.80*	22,990	*9.64*	*111,369*	*110.17*
Mar.	32,904	*22.38*	24,732	*14.59*	*114,459*	*93.49*
Apr.	34,729	*15.98*	24,132	*11.98*	*117,394*	*189.69*
May	....	.....	....	.....	....	......
June	....	....	....	.....	....	......

Houston Electric Company, Houston, Tex.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $* †	Increase or Decrease Per Cent* †
June, 1930	247,461	*11.67*	179,084	*10.27*	589,240	*6.38*
July	247,070	*10.86*	176,909	*11.82*	584,163	*1.24*
Aug.	244,033	*12.41*	177,452	*10.89*	573,872	*4.18*
Sept.	251,919	*9.00*	175,905	*10.42*	571,857	*5.84*
Oct.	267,306	*7.57*	181,499	*10.67*	573,425	*4.16*
Nov.	247,210	*10.00*	176,739	*1.96*	550,635	*9.56*
Dec.	258,219	*9.84*	180,678	*0.68*	524,458	*16.64*
Jan., 1931	242,554	*10.52*	176,792	*11.08*	518,843	*17.70*
Feb.	223,256	*14.11*	163,249	*12.96*	507,328	*20.19*
Mar.	244,396	*10.97*	170,067	*12.70*	502,405	*19.39*
Apr.	....	.....	....	.....	......	......
May	....	.....	....	.....	......	......
June	....	.....	....	.....	......	......

Hudson & Manhattan Railroad, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	989,627	*1.69*	499,396	*1.74*	154,985	*4.49*
July	954,538	*3.12*	502,515	*1.61*	116,747	*15.77*
Aug.	934,204	*5.65*	499,806	*3.98*	98,977	[illegible]
Sept.	974,433	*2.80*	506,845	0.23	132,332	*18.68*
Oct.	1,033,584	*4.33*	521,325	*1.97*	176,999	*17.79*
Nov.	994,735	*6.18*	489,761	*4.08*	169,465	*21.42*
Dec.	1,060,614	*4.66*	419,109	*17.40*	306,321	12.49
Jan., 1931	1,005,022	*7.62*	512,350	*7.23*	157,098	*21.78*
Feb.	936,542	*5.67*	467,137	6.09	134,717	*16.34*
Mar.	1,013,577	*6.05*	497,695	*6.34*	180,554	*15.13*
Apr.	1,002,265	*5.78*	485,938	*5.73*	181,182	*15.09*
May	974,737	*6.24*	481,504	*5.53*	158,191	*18.77*
June	941,598	*4.82*	477,392	*4.41*	128,896	*16.83*

Illinois Terminal Company, Springfield, Ill.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	566,548	*8.98*	444,638	0.00	86,421	*35.96*
July	601,515	*11.03*	475,856	*3.24*	87,602	*35.74*
Aug.	661,520	*7.65*	466,816	*12.07*	152,827	12.15
Sept.	654,477	*5.26*	454,818	*9.66*	160,897	14.62
Oct.	691,672	*2.54*	506,107	*2.41*	148,701	11.61
Nov.	542,672	*11.02*	430,907	*6.24*	80,529	*23.11*
Dec.	577,425	*13.69*	421,987	*14.26*	127,588	5.66
Jan., 1931	509,641	*20.77*	395,953	*19.80*	87,742	9.83
Feb.	498,067	*5.89*	388,126	*3.81*	84,381	2.26
Mar.	568,653	*1.95*	398,855	*5.94*	143,325	28.98
Apr.	547,992	*7.17*	395,315	*6.46*	127,179	*3.24*
May	581,953	*4.34*	389,538	*8.87*	162,905	13.83
June	....	....	....	...	....	.....

Interborough Rapid Transit Company, New York, N. Y.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
June, 1930	5,832,071	1.85	4,027,730	10.58	*218,727*	*348.57*
July	5,382,547	*1.53*	4,078,983	2.52	*521,582*	*73.64*
Aug.	5,183,166	*4.59*	4,121,083	5.06	*763,482*	*172.17*
Sept.	5,684,267	0.17	3,983,368	7.78	*131,270*	[illegible]
Oct.	6,315,679	*1.13*	4,162,660	*0.83*	161,417	207.14
Nov.	5,965,365	*4.96*	3,869,340	0.00	*272,021*	*121.79*
Dec.	6,477,864	*0.52*	4,194,315	3.96	*293,152*	*47.40*
Jan., 1931	6,123,645	*4.42*	4,538,833	10.83	*348,972*	[illegible]
Feb.	5,570,354	*3.27*	3,653,798	*2.10*	*321,587*	*10.36*
Mar.	6,293,013	*2.24*	3,973,704	*4.61*	*212,644*	6.65
Apr.	6,127,713	*2.38*	3,993,181	*2.83*	*189,134*	*17.33*
May	6,006,273	*4.47*	3,932,452	*3.98*	*207,096*	*36.12*
June	....	.....	....	...	....	.....

Jacksonville Traction Company, Jacksonville, Fla.

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $* †	Increase or Decrease Per Cent* †
June, 1930	79,087	*12.73*	77,848	*7.08*	*71,399*	*41.50*
July	78,772	*11.02*	77,787	*11.27*	*70,688*	*35.34*
Aug.	77,441	*12.10*	78,177	*13.82*	*68,188*	*19.92*
Sept.	78,529	*9.54*	75,012	*11.15*	*66,335*	*8.16*
Oct.	84,424	*12.50*	76,374	*13.72*	*65,525*	*2.18*
Nov.	81,250	*12.24*	69,437	*16.02*	*62,599*	0.15
Dec.	89,903	*11.47*	74,836	*11.49*	*63,204*	*4.62*
Jan., 1931	87,160	*8.08*	77,998	*13.67*	*58,133*	11.98
Feb.	76,205	*15.60*	75,462	*28.14*	*77,874*	*23.42*
Mar.	84,018	*12.36*	77,758	*4.09*	*87,048*	*31.90*
Apr.	81,695	*11.48*	74,847	*6.57*	*92,573*	*142.13*
May	80,798	*9.96*	76,856	*4.57*	*97,550*	*46.33*
June	....	.....	....	...	....	.....

†Net income is shown for the preceding twelve months.

Trend of Revenues and Expenses by Months *(Concluded)*

	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease PerCent*
Kansas City Public Service Company, Kansas City, Mo.					†	†
June, 1930.....	656,292	*8.03*	562,308	*4.19*	6,396	*84.76*
July..........	635,205	*11.09*	573,990	*2.92*	*21,365*	*144.42*
Aug..........	622,554	*13.17*	530,094	*11.41*	15,479	*64.11*
Sept..........	650,114	*9.99*	524,324	*12.12*	50,261	*1.32*
Oct..........	725,428	*4.89*	700,311	12.90	*60,435*	*190.35*
Nov..........	706,577	*5.29*	572,066	*7.04*	58,994	*5.69*
Dec..........	758,045	*1.73*	570,065	*14.58*	108,444	*284.88*
Jan., 1931.....	....	.....	....	.....	......	.....
Feb..........	....	.....	....	.....	......	.....
Mar..........	....	.....	....	.....	......	.....
Apr..........	710,719	*0.69*	565,328	*6.09*	71,298	82.34
May..........	702,760	*2.35*	562,482	*5.31*	64,474	42.86
June..........	....	.....	....	...	....	.....
Long Island Railroad, New York, N. Y.						
June, 1930.....	3,662,765	*4.22*	2,512,947	*3.06*	994,868	*4.62*
July..........	4,018,939	*5.76*	2,668,042	*3.56*	1,180,528	*11.19*
Aug..........	3,968,936	*5.21*	2,635,376	*5.06*	1,152,651	6.59
Sept..........	3,589,671	*7.33*	2,467,056	*7.07*	928,655	*6.58*
Oct..........	3,371,761	*5.80*	2,446,346	*8.97*	729,067	1.77
Nov..........	2,954,624	*4.20*	2,249,258	*14.56*	483,180	89.15
Dec..........	2,905,045	*6.60*	2,130,182	*16.27*	596,812	47.11
Jan., 1931.....	2,763,421	*5.65*	2,210,263	*9.65*	321,141	*6.00*
Feb..........	2,561,169	*7.43*	2,074,216	*9.13*	332,002	*3.86*
Mar..........	2,841,915	*3.09*	2,234,418	*9.00*	449,501	24.64
Apr..........	2,976,402	*4.69*	2,269,029	*7.37*	533,425	1.97
May..........	3,212,765	*4.00*	2,338,313	*8.03*	695,032	9.93
June..........	....	.....	....	.....	....	.....
Market Street Railway, San Francisco, Cal.						
June, 1930....	743,277	*4.64*	646,615	*1.84*	42,297	*31.01*
July..........	735,453	*5.87*	649,901	*1.68*	32,534	*46.39*
Aug..........	770,284	*6.69*	643,287	*5.46*	72,923	*16.56*
Sept..........	745,298	*5.35*	626,770	*3.74*	64,731	*16.38*
Oct..........	786,012	*6.73*	675,908	*6.49*	57,384	*45.58*
Nov..........	729,407	*8.81*	615,613	*6.18*	60,457	*29.25*
Dec..........	775,508	*5.12*	639,249	*5.52*	83,460	*0.03*
Jan., 1931.....	738,092	*5.55*	641,519	*4.83*	45,011	*12.31*
Feb..........	668,931	*8.17*	576,661	*8.22*	41,002	7.29
Mar..........	757,960	*6.40*	633,346	*6.81*	72,828	*0.05*
Apr..........	745,252	*6.72*	620,106	*7.06*	73,837	*3.46*
May..........	733,105	*7.50*	619,934	*8.21*	62,805	2.08
June..........	704,769	*5.19*	654,225	1.75	37,384	*11.62*
New York, Westchester & Boston Railway, New York, N. Y.						
June, 1930....	227,026	1.80	147,692	*4.06*	*147,821*	*2.82*
July..........	224,469	*5.89*	146,233	*6.00*	*152,633*	*5.38*
Aug..........	196,405	*10.53*	152,180	*0.41*	*184,982*	*22.45*
Sept..........	203,617	*8.18*	165,256	6.57	*192,861*	*29.53*
Oct..........	202,046	*7.52*	138,192	*14.09*	*190,748*	*20.81*
Nov..........	184,690	*8.74*	170,542	2.52	*216,451*	*19.75*
Dec..........	190,136	*12.31*	138,592	*17.80*	*205,029*	16.75
Jan., 1931.....	182,249	*13.76*	160,800	9.44	*220,394*	*32.37*
Feb..........	161,311	*15.02*	149,571	*11.18*	*222,308*	*29.42*
Mar..........	181,729	*12.80*	144,442	3.54	*195,802*	*24.31*
Apr..........	186,708	*13.03*	142,832	0.31	*189,142*	*19.00*
May..........	195,905	*15.11*	149,268	*0.42*	*186,389*	*25.70*
June..........	....	.....	....	...	....	.....
Northwestern Pacific Railroad, Sausalito, Cal.						
June, 1930....	504,138	*4.31*	448,510	*3.76*	42,824	*29.33*
July..........	597,419	*2.54*	392,575	*18.52*	195,195	55.38
Aug..........	638,476	*11.48*	415,502	*18.64*	210,115	4.03
Sept..........	548,282	*8.68*	471,657	*3.78*	16,471	*83.57*
Oct..........	555,867	*18.49*	534,858	4.44	7,447	*95.22*
Nov..........	333,193	*27.74*	421,717	*16.33*	97,567	*120.85*
Dec..........	312,319	*20.77*	465,220	*3.46*	158,491	*74.63*
Jan., 1931.....	283,852	*21.78*	401,656	*14.41*	123,928	*14.76*
Feb..........	273,818	*27.40*	387,512	*12.96*	*122,531*	68.87
Mar..........	308,466	*24.17*	408,068	*14.43*	*109,855*	*48.81*
Apr..........	322,742	*25.66*	402,400	*16.55*	*88,300*	*58.51*
May..........	346,743	*28.51*	362,722	*24.85*	*28,886*	*931.64*
June..........	....	.....	....	...	....	.....
Staten Island Rapid Transit Company, New York, N. Y.						
June, 1930....	224,980	*18.51*	178,999	*10.17*	30,052	*30.63*
July..........	243,991	9.78	189,173	39.19	41,021	*34.99*
Aug..........	233,371	*13.92*	168,110	*11.19*	49,486	*33.97*
Sept..........	206,908	*15.93*	165,525	*4.87*	26,127	*60.73*
Oct..........	205,631	*10.58*	167,586	*6.49*	29,723	*26.11*
Nov..........	178,652	*17.42*	161,608	*0.58*	10,788	*80.37*
Dec..........	178,474	*9.08*	160,715	47.29	5,997	*92.23*
Jan., 1931.....	170,387	*9.58*	158,982	*6.35*	*1,448*	*114.6*
Feb..........	161,415	*13.58*	142,565	*9.20*	2,151	*93.49*
Mar..........	173,723	7.98	159,035	*7.78*	*1,164*	*81.24*
Apr..........	176,863	*10.76*	147,210	*13.23*	23,169	*31.91*
May..........	188,151	*11.61*	163,148	*7.61*	9,268	*63.19*
June..........	....	.....	....	...	....	.....
Third Avenue Railway System, New York, N. Y.						
June, 1930‡....	1,244,961	*6.73*	1,018,619	*7.64*	45,078	1,056.24
July..........	1,429,730	*5.18*	1,212,311	*8.54*	2,066	106.36
Aug..........	1,350,064	*5.88*	1,180,853	*8.08*	*46,540*	28.34
Sept..........	1,428,136	*3.48*	1,167,528	*8.36*	45,636	277.91
Oct..........	1,456,688	*4.03*	1,205,455	9.73	36,257	317.06
Nov..........	1,373,335	*5.37*	1,146,168	*10.17*	12,079	130.15
Dec..........	1,438,752	*3.49*	1,197,249	*8.51*	26,250	186.44
Jan., 1931.....	1,393,054	*5.10*	1,178,797	*9.14*	*1,594*	96.33
Feb..........	1,274,832	*4.27*	1,070,307	*8.56*	*11,143*	*126.49*
Mar..........	1,418,429	*3.38*	1,174,984	*6.86*	27,364	430.88
Apr..........	1,408,235	*3.25*	1,155,880	*5.98*	44,331	250,25
May..........	1,464,031	*4.29*	1,072,584	*7.70*	76,972	32.40
June..........	....	.....	....	...	....	.....

*Decreases or deficits are shown by *italic figures.*
†Net income is shown for the preceding twelve months.
‡Excluding buses.

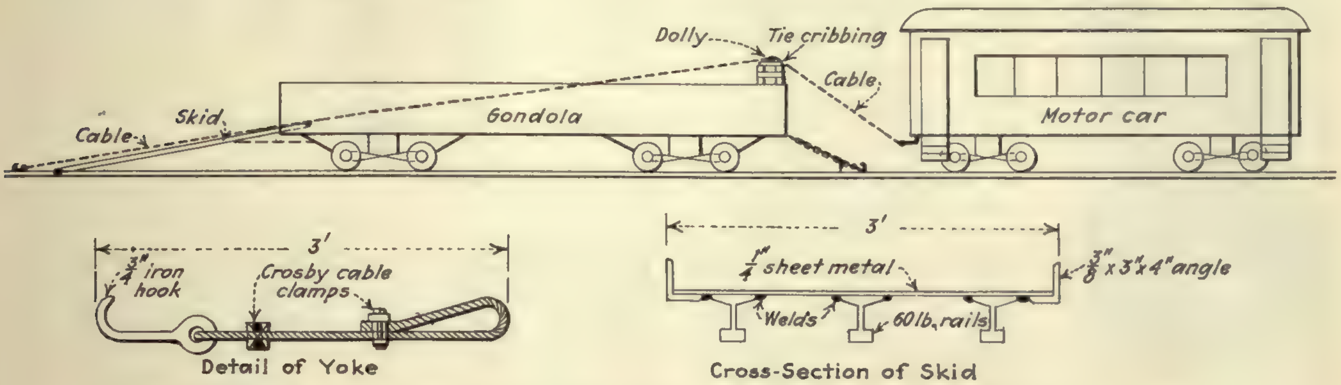
	Operating Revenue $	Increase or Decrease Per Cent*	Operating Expenses and Taxes $	Increase or Decrease Per Cent*	Net Income $*	Increase or Decrease Per Cent*
United Electric Railways, Providence, R. I.						
June, 1930....	532,783	*13.87*	478,197	*5.39*	4,583	*85.66*
July..........	513,367	*11.04*	458,817	*8.90*	5,480	*77.94*
Aug..........	495,723	.....	442,076	.....	3,643	.....
Sept..........	493,296	*12.72*	434,036	*10.39*	8,376	*72.04*
Oct..........	531,803	*13.76*	....	.....	41,223	*53.80*
Nov..........	506,318	*14.58*	439,930	*12.83*	16,958	*54.37*
Dec..........	559,363	*13.02*	460,420	*21.92*	51,623	889.51
Jan., 1931....	543,940	*13.39*	493,596	*12.94*	372	*95.68*
Feb..........	482,566	*14.30*	437,444	*13.02*	*4,503*	*150.71*
Mar..........	524,299	*10.44*	480,958	*9.38*	*6,233*	*265.73*
Apr..........	510,645	*9.39*	470,964	*7.60*	*9,992*	*455.60*
May..........	509,278	*10.64*	474,803	*7.52*	*15,021*	*168.13*
June..........	482,703	*9.40*	438,362	*8.15*	*4,633*	*201.09*
United Railways & Electric Company, Baltimore, Md.						
June, 1930.....	1,332,275	*2.63*	1,043,008	[illegible]	35,318	4.76
July..........	1,236,414	*6.91*	964,582	*6.24*	14,358	*59.85*
Aug..........	1,198,180	*8.34*	831,241	*18.41*	6,119	*71.48*
Sept..........	1,261,734	*6.71*	995,805	*5.02*	10,050	*75.81*
Oct..........	1,354,086	*7.28*	1,049,306	*4.84*	25,163	*71.16*
Nov..........	1,263,811	*10.26*	983,047	*7.40*	9,200	*87.30*
Dec..........	1,350,553	*8.19*	1,043,315	*7.25*	36,700	*54.54*
Jan., 1931.....	1,268,536	*10.90*	994,411	*11.89*	7,388	*69.22*
Feb..........	1,136,604	*15.78*	891,421	*15.97*	*24,088*	*231.16*
Mar..........	1,262,429	*14.90*	981,026	*14.76*	12,212	*84.94*
Apr..........	1,253,764	*13.50*	966,424	*13.56*	11,440	[illegible]
May..........	1,256,334	*13.78*	991,107	*11.93*	2,206	*96.99*
June..........	....	.....	....	...	....	.....

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Kansas City, Clay County & St. Joseph Ry., Kansas City, Mo.					
4 mo. end. April, 1931	134,996	134,923*a*	....	73*c*	*61,061*
4 mo. end. April, 1930	186,791	172,325*a*	....	14,466*c*	*46,939*
Lethbridge Municipal Railway, Lethbridge, Alta.					
4 mo. end. April, 1931	14,123	13,392	....	....	*9,517*
4 mo. end. April, 1930	....	....	....	....	*7,016*
Memphis Street Railway, Memphis, Tenn.					
April, 1931..........	202,809	147,470*a*	....	55,350	7,872*d*
April, 1930..........	242,322	160,141*a*	....	82,352	36,910*d*
12 mo. end. April, 1931	2,531,369	1,847,312*a*	....	684,879	128,651*d*
12 mo. end. April, 1930	2,896,037	1,960,739*a*	....	935,982	403,438*d*
Mexico Tramways, Mexico City, Mex. (In pesos)					
May, 1931..........	800,620	844,240	....	*43,620*	....
May, 1930..........	859,600	927,280	....	*67,680*	....
5 mo. end. May, 1931	3,844,210	4,281,950	....	*437,740*	....
5 mo. end. May, 1930	4,184,210	4,460,620	....	*276,410*	....
Middlesex & Boston Street Ry., Newtonville, Mass.					
3 mo. end. Mar., 1931	66,640	....	....	....	35,382
3 mo. end. Mar., 1930	59,315	....	....	....	20,237
New York State Railways, Rochester, N. Y.					
3 mo. end. Mar., 1931	1,796,414	1,694,215	....	117,851	*250,882*
3 mo. end. Mar., 1930	2,229,579	1,983,406	....	276,963	*95,673*
New York Railways, New York, N. Y.					
May, 1931..........	465,987	394,887*a*	....	71,100	33,166*b*
May, 1930..........	486,467	433,427*a*	....	53,040	*8,003b*
5 mo. end. May, 1931	2,198,742	1,850,951*a*	....	347,791	55,361*b*
5 mo. end. May, 1930	2,269,863	2,092,213*a*	....	177,650	*132,187b*
Regina Municipal Railway, Regina, Sask.					
4 mo. end. April, 1931	118,542	90,814	....	27,728	*26,655*
5 mo. end. May, 1931	141,176	110,705	....	....	*40,765*
5 mo. end. May, 1930	....	....	....	....	*12,015*
Saskatoon Municipal Railway, Saskatoon, Sask.					
3 mo. end. April, 1931	87,852	62,385	3,434	....	*8,910*
5 mo. end. May, 1931	132,975	99,672	5,189	....	*23,339*
5 mo. end. May, 1930	....	....	....	....	*3,979*
Springfield Street Railway, Springfield, Mass.					
3 mo. end. Mar., 1931	7,209,984	7,078,100	....	133,080	63,861
3 mo. end. Mar., 1930	7,874,771	7,723,267	....	152,976	81,727
Twin City Rapid Transit Co., Minneapolis, Minn.					
3 mo. end. June, 1931	2,724,780	2,109,071	....	615,709	112,925
3 mo. end. June, 1930	3,019,470	2,226,077	....	793,392	211,426
6 Mo. end. June, 1931	5,707,023	4,358,474	....	1,348,549	334,242
6 mo. end. June, 1930	6,598,966	4,766,007	....	1,832,958	645,037
United Traction Co., Albany, N. Y.					
5 mo. end. May, 1931	854,857	797,383*a*	....	67,169	....
5 mo. end. May, 1930	1,011,930	871,565*a*	....	147,474	....

Italic figures indicate deficits. *a* Includes taxes. *b* Before adjustment bond interest. *c* After depreciation. *d* Before depreciation.

Practical MAINTENANCE *Ideas*



Detail of Yoke

Cross-Section of Skid

The New Orleans Public Service removed rails from 12 miles of open track by pulling them onto gondolas

Rail Removal at Low Cost

By A. H. Guillot
Chief Engineer, Roadway Department
New Orleans Public Service

REMOVAL of 12 miles of track was recently accomplished by the New Orleans Public Service with speed and economy by the use of a novel method of loading rails into gondolas. Near one end of the line was an interchange track, and scattered along the line were sidings at intervals of about 1 mile. Arrangements were made with the steam railroads to place drop-end gondolas on the interchange tracks where an old interurban motor car transported the gondolas over the line.

The rails were loaded into the gondola by means of a steel skid and a cable. One end of the skid was placed on the gondola and the other rested on the ground. The skid was fastened to the gondola by means of a hook and cable. On the end of the gondola nearest the motor car, a tie cribbing was placed, to which was fastened a wooden dolly with cable guards. The cable for pulling the rails was anchored to the motor car, and ran over the dolly.

Before removing the rails, the bolts were burned through the joint plates, and the joint was broken in order to insert the hook of a yoke in the bolt hole. The yoke was a ⅜-in. piece of flexible cable, 3 ft. long, one end of which was fastened to the hook and the other end was made into a loop with Crosby clips. The motor car pulled this rail up to the next rail in the track, and the yoke attached to this rail was fastened to the cable hook without stopping the movement of the first rail. This procedure continued until four rails were fastened to the pulling cable by means of yokes and pulled in directly on the gondola, sliding up the skid.

After loading the four rails, the motor car was again coupled to the gondola by means of a quickly detachable hook and chain, and pulled the gondola ahead so that four more rails could be loaded. The interval of each movement of the gondola was about 6 min.

On the average, about 9,000 ft. of rail per day were loaded on the gondola. The crew worked ten hours, of which 8½ hours constituted actual working time while 1½ hours were spent in switching operations. The crew consisted of one foreman, one burner, one motorman, and ten laborers, resulting in a total labor cost of $50.30 per day. On this basis, the cost was 1.1 cent per track-foot, or 53 cents per ton for removing and loading the rails. These cost figures are accurate only for tangent track. Where special work was encountered the speed was reduced to approximately 3,000 track-feet per day.

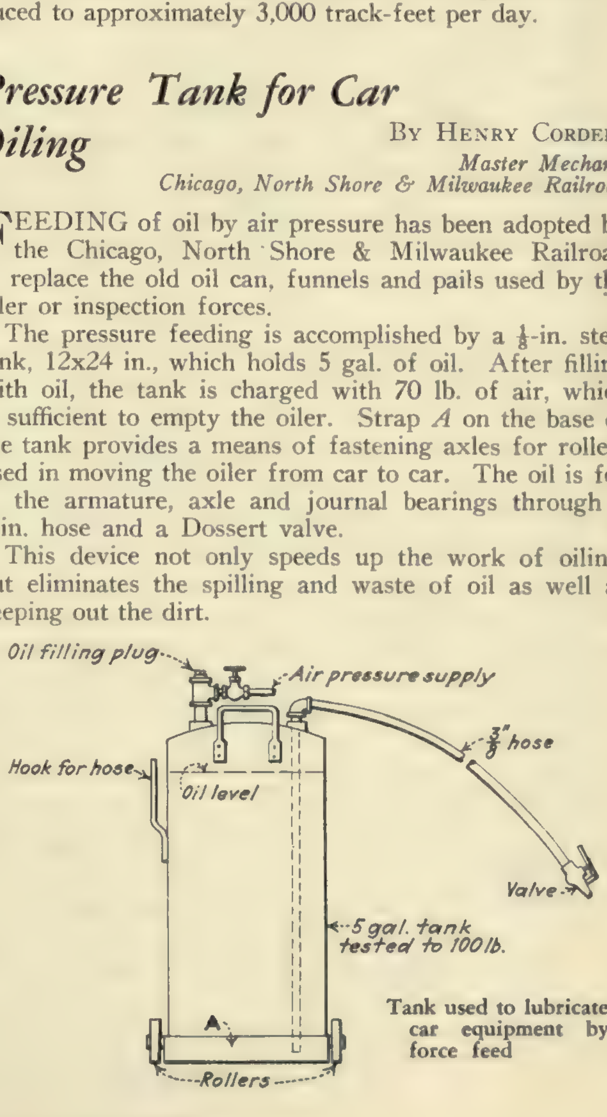
Pressure Tank for Car Oiling

By Henry Cordell
Master Mechanic
Chicago, North Shore & Milwaukee Railroad

FEEDING of oil by air pressure has been adopted by the Chicago, North Shore & Milwaukee Railroad to replace the old oil can, funnels and pails used by the oiler or inspection forces.

The pressure feeding is accomplished by a ⅛-in. steel tank, 12x24 in., which holds 5 gal. of oil. After filling with oil, the tank is charged with 70 lb. of air, which is sufficient to empty the oiler. Strap *A* on the base of the tank provides a means of fastening axles for rollers used in moving the oiler from car to car. The oil is fed to the armature, axle and journal bearings through a ⅜-in. hose and a Dossert valve.

This device not only speeds up the work of oiling, but eliminates the spilling and waste of oil as well as keeping out the dirt.



Tank used to lubricate car equipment by force feed

Full Composition Insulator for Feeder Wires

Composition prongs in this feeder wire insulator have reduced accidents

FOR many years the standard insulator used in Brooklyn for supporting overhead weatherproof insulated feeders was the ordinary saddle top type with a body of insulating material supporting a metal cap with prongs, between which the wire rested. The only places where full composition insulators were used were at corners or similar locations where it was necessary to use the side groove. Occasionally, however, men were burned by touching simultaneously the metal cap of the insulator and some grounded metal, such as the trolley pole or a portion of the elevated structure. Of course, this occurred only when the weatherproof insulation of the wire had been worn completely through and the cap has thus been made alive.

To avoid such accidents, even though they occurred infrequently, it was decided to standardize on an insulator similar to the one in use, but without the metal cap. At that time there were no insulators of the desired type on the market, but a satisfactory design was developed, the new insulator being a modification of the ordinary top and side groove insulator, the prongs having been made longer so as to do away with tying in the wire on straight line work. These insulators have proved satisfactory in service and the railway has standardized upon them.

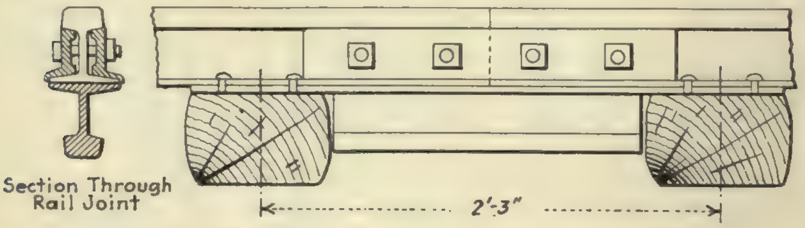
*Joint Booster Saves Track**

By M. W. Wales

Engineer of Way and Structures
Winnipeg Electric Company

DURING 1930, we reinforced 300 joints with scrap rail, as shown in the illustration, on one of our open track lines where 70 per cent of the joints were low and 10 per cent were badly cupped. When these boosters were installed the track was put in first-class operating condition. Joints were tightened and built up by welding and grinding. The boosters were made from scrap rail of the same weight as the rail in the track. The total cost of each booster, including the installation, the labor necessary for cutting the rail and the scrap value, was 65 cents.

When the tracks were inspected this spring, it was found that where joint boosters were installed, the joints were still in first-class condition. On the other hand, joints without boosters on the same line were beginning to go bad again, and will need considerable repair. As a result of this trial, we are planning to install at least 300 more joint boosters.



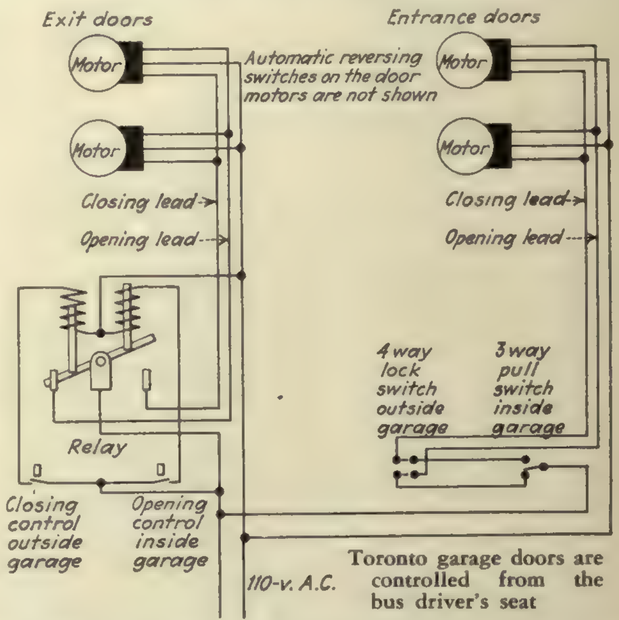
Joints reinforced with scrap rail have shown better wearing qualities in Winnipeg

*Modern "Sesame" Opens Garage Doors**

By J. C. de la Rosa

Toronto Transportation Commission

DURING the severe cold weather we experience in Toronto it is urgent that garage doors be kept shut except for short intervals to permit entrance and exit of buses. To accomplish this without an attendant at the doors a scheme was devised to open garage doors by inserting a key in a four-way lock switch located at the point of entrance within reach of the operator while sitting in the bus. After the bus has been driven into the garage and clear of the doors they are shut again by pulling a cord on a three-way pull switch conveniently located. A similar arrangement is provided for the exit doors. A cord controlling a single-pole momentary-contact pull switch can be made to energize a solenoid which closes a switch in the control circuit of the exit door. When this cord is pulled, the exit doors will open. After driving out of the garage and clear of the doors a momentary-contact push button is found, which can be made to energize another solenoid and thus close the doors. The closing switches of both solenoids at the exit doors are operated on a balanced principle so that when one switch is closed the other is opened.


Exit doors
Entrance doors
Motor
Motor
Motor
Motor
Automatic reversing switches on the door motors are not shown
Closing lead
Opening lead
Closing lead
Opening lead
4 way lock switch outside garage
3 way pull switch inside garage
Relay
Closing control outside garage
Opening control inside garage
110-v. A.C.

Toronto garage doors are controlled from the bus driver's seat

As part of the door mechanism at both the entrance and exit, a mechanical switch automatically opens the circuit upon the completion of one operation, and at the same time closes the other circuit for the succeeding operation. Entrance to the garage can be had only with a key, and then only through the entrance door.

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*Submitted in Electric Railway Journal *Prize Contest.*

Control Equipment Profits by ADEQUATE INSPECTION

By G. L. MOSES
Renewal Parts Engineer
Westinghouse Electric and Manufacturing Company

LIGHT inspection of car control equipment should be made frequently enough to discover incipient defects and so prevent road failures. The periods which have been found satisfactory are 1,000 miles or one week, depending on whether the time or the mileage basis is used. Only minor repairs should be made on the car during inspection. Major repairs should be made by replacing the faulty apparatus with new or repaired parts, making the necessary repairs at the bench on the parts removed.

All apparatus should be kept free from dust, dirt, grease, gum, moisture and injurious oils and acids. Equipment may be cleaned by blowing it out with compressed air, but moisture in the air must be avoided Insulated bolts supporting parts should be kept clean. The leads should be inspected for signs of overheating or breakage. If such are observed the cause should be determined and corrected at once.

During inspection and repair power should be kept off the car by pulling down the trolley and opening the main

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Inspection Detail Outlined

K Controllers

1. Check cover for fit and make sure that the latch holds it securely.

2. Check interlock between main and reverse drum to make sure that reverse handle cannot be removed with reverse drum thrown in either direction and that main drum cannot be operated with reverse drum in "off" position.

3. Check play in drum bearing (not to exceed 3/32-in. total in any one bearing).

4. Inspect arc deflector and replace any plates burned to a depth of ⅛ in. or more.

5. Inspect main and reverse drum segments and arcing tips and replace those burned or badly worn (3/32 in. deep).

6. File smooth and clean any segments that are slightly burned or have burrs.

7. Replace fingers with as much as ⅛ in. to 3/16 in. worn off the contact.

8. File clean any fingers with slight burrs or burned spots which may be continued in service.

9. Adjust fingers to have ⅛ in. rise from free position to position on drum. Check in all notches.

10. Check finger pressure (on old style fingers 6 to 8 lb.; on compensating fingers 3½ to 5½ lb.)

11. Lubricate drum segments with light oil by means of brush or cloth, wiping off surplus.

12. Lubricate bearings with light machine oil.

13. Operate controller several times, checking for ease of action and positive notching.

Handle Switches

1. Remove cover and inspect.

2. Replace burned contact carriers and clutch fingers.

3. Check drum segments and fingers and replace where worn or burned.

4. Check alignment and clearance between upper and lower clutch. This should be 1/32 in. to 1/16 in.

5. Check drum for tightness of set screw fastening it to controller shaft.

6. Operate several times with power on and note both electrical and mechanical action.

Platform Circuit Breakers

1. Remove cover and arc chute and inspect wearing, burning and current-carrying parts.

2. Inspect contacts and arcing horns. Contacts should be replaced when 3/32 in. material has been worn or burned away.

3. Replace arc chute parts which are burned as much as half way through the material.

4. Operate several times to check freedom of movement.

Line Switches and Switch Groups

1. Check for tightness of covers.

2. Replace contacts when worn or burned away as much as ⅛ in.

3. Replace badly burned arcing horns.

4. Replace arc chute parts when burned half way through.

5. Tighten all terminal bolts and current-carrying connections.

6. On switches with main wiring compartment, carefully blow out all dirt and foreign matter with clean dry air.

7. Check alignment and freedon of operation of all moving parts.

8. Clean all insulation, particularly on bolts supporting the apparatus.

9. Inspect interlocks for wear or burning of contacts and fingers, replacing any damaged parts.

10. Check overload relay for ease of movement, setting of trip and burning of contacts.

11. Inspect resistor tubes for signs of overheating.

12. Use control voltage (and air for pneumatic equipment) operate switches to make sure that each has positive action and is not sluggish either in opening or closing.

Master Controllers

1. Check to insure that it operates freely and yet notches positively in each position.

2. Check the interlock between the main drum and reverse drum.

3. Inspect and test tension of all fingers. Tension should be from 1½ to 3 lb. according to the type of finger. Fingers must make good contact in all positions.

4. Replace fingers which show signs of stubbing or have burrs from arcing.

5. Smooth up the drum if it has any rough or burned spots.

6. Lubricate drum segments with light machine oil.

7. Lubricate bearings with machine oil.

Reversers

1. Check covers for tightness of fit and positive latching.

2. Inspect for overheating of drum contacts and fingers.

3. Replace fingers that are worn ⅛ in. deep, are burned or show signs of losing contact pressure.

4. Lubricate drum contacts with light machine oil with brush or cloth, and wipe off excess.

5. Lubricate bearings with light machine oil.

6. Operate by hand and by power to check ease of movement.

Fuse Boxes

1. Observe fuse to see if it is burned or shows obvious signs of heavy overloads; replace if badly oxidized or broken.

2. Check tightness of clamps holding fuse in place.

Main Knife Switches

1. Inspect for signs of overheating.

2. Check contact between blade and jaws.

3. Check for alignment and tightness of all parts.

Resistors

1. Look for burned-out resistor elements.

2. Inspect for signs of overheating.

3. Check for loose bolts and connections.

4. Remove any dirt accumulations.

knife switch. When power is absolutely necessary for checking the action of the apparatus extreme care should be exercised.

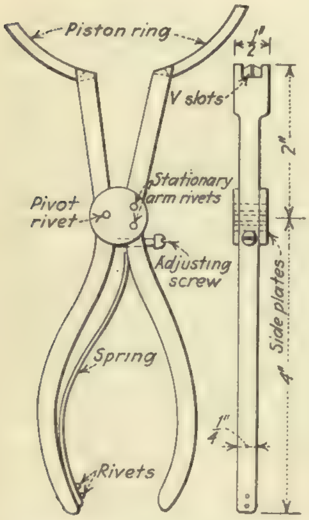
With pneumatic control the air supply should be checked and all valves and joints inspected for leaks. Drain cocks should be opened to discharge moisture.

Upon completion of detail inspection and repairs a sequence test should be given the control to make sure that all apparatus functions properly and the sequence of operation is correct. With K type control, the car should be operated in both directions, making sure that the line switch comes in and drops out properly and that the car accelerates correctly. On remote control equipments, the switches should be operated with the main knife switch open and the car operated in both directions to make sure that the car accelerates properly.

Details to be observed in inspection of control are given in the instructions.

*Expander Saves Piston Rings**

By Charles Herms
General Foreman
San Diego Electric Railway



This piston ring expander has a stop that prevents stretching the rings too far

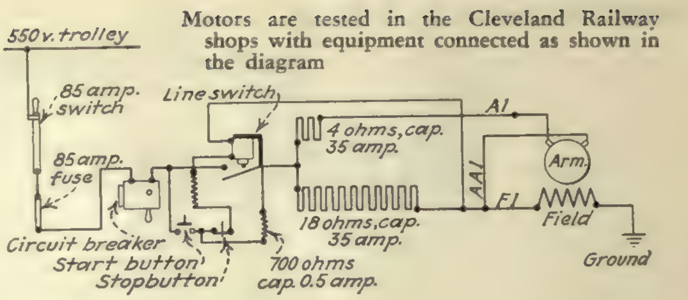
PISTON rings are inserted in the grooves by means of pliers with V-shaped slots at the ends. Before the rings are slipped over the head of the piston they are expanded, and unless this is done with care the rings will be stressed beyond their strength and break. We use pliers with a set screw which can be adjusted to limit the extent to which the rings are expanded. The maximum opening of the pliers is determined when inserting the first ring, and the screw is set for this limit. The other rings can then be expanded without fear of breakage.

*Testing Railway Motors in the Shops**

By Christ Reinker
General Foreman Mechanical Department
Cleveland Railway

REPAIRED motors are now tested thoroughly in the shops of the Cleveland Railway before they are mounted on the car. Previously, when the motors were tested on the cars some of them passed the short circuit test, but failed later in operation because it was impossible to locate all defects. With the present method, the workman determines immediately if the motor is in satisfactory condition. The method also saves time, since if a defect is apparent, it is not necessary to dismount the motor from the truck and return it to the repair room.

The motor to be tested is placed on a stand and is connected up as shown in the diagram. The resistance grids are mounted overhead along with the circuit breaker, so that they are out of the way of the workmen. When the motor has been connected, the workman presses the starting button. The armature should reach full speed almost immediately. It is allowed to run and carefully watched. Overheating of bearings indicates that they are fitted too tight. If the motor speed is too high, too low, or irregular, defects are indicated which must be corrected. Failure to start indicates an open field, in which event the line switch does not close.



Motors are tested in the Cleveland Railway shops with equipment connected as shown in the diagram

The approximate cost of this equipment is $110

Philadelphia's Trolley-Break Record Continues at High Level

By H. S. Murphy
Staff Engineer
Philadelphia Rapid Transit Company

RECORDS of trolley breaks are always of interest to electric railway operators. The last report of the Trolley Wire Committee of the American Electric Railway Engineering Association shows that during 1929, on approximately 11,000 miles of electric railway lines, there was an average of nine trolley breaks every two days. This is one break for every 250,000 car-miles.

The Philadelphia Rapid Transit Company has shown a consistently good trolley break record ever since the Trolley Wire Committee started to accumulate data on breaks in 1921. This property for the last seven years has had an average of one trolley break every 4¼ days, or one break for each 828,000 car-miles. This includes breaks due to all causes. The record for breaks under the control of line maintenance forces, usually called breaks due to wire and fittings, is one for every 9.8 days, or every 1,910,000 car-miles. During this seven-year period 499,000,000 car-miles were operated. This figure includes 1,400,000 trolley bus-miles. The present length of line on a single-track basis is approximately 567 miles of rail and 13 miles of trolley-bus line.

The record for each year, both as to number of breaks and breaks per 100,000 car-miles, is shown in the table. During the first five months of 1931, there have been only four breaks all due to causes beyond the control of the line maintenance forces. Approximately 30,000,000 car-miles were operated during this period.

	Trolley Breaks		Trolley Breaks per 100,000 Car-Miles	
Year..................	Total	Due to Wire and Fittings	Total	Due to Wire and Fittings
1924..................	95	39	0.128	0.053
1925..................	87	36	0.130	0.054
1926..................	114	54	0.168	0.080
1927..................	86	40	0.118	0.055
1928..................	85	35	0.121	0.050
1929..................	76	36	0.114	0.054
1930..................	59	21	0.093	0.033
	602	261	0.121	0.052

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*Submitted in Electric Railway Journal *Prize Contest.*

Market, Chestnut and Walnut Streets in downtown Philadelphia are three of the heaviest traffic streets in the world. No trolley breaks from any cause have occurred on Market Street since 1927, and none have occurred on the other streets since 1923. This means that 1,200,000 cars have passed under the Market Street wire and 3,600,000 cars under the Chestnut and Walnut Street wire since the last break. The normal life of the wire under this heavy service is between 1,600,000 and 2,200,000 car movements.

These results have been attained without excessive expense for maintenance or renewals of trolley wire. The amount of wire used for replacements has been steadily decreasing. The principal contributing factor has been a maintenance force trained to prevent breaks by knowing the heavy-wear spots, and making simple inexpensive repairs in time to avoid trouble. A large portion of the responsibility has been placed on the linemen, who are the only men who can prevent trolley breaks. The results, in my opinion, show that this confidence has not been misplaced.

In recent years a number of companies have made trolley-break records somewhat better than this, but we know of no equal sustained performance over so long a period. If there are any other records as good or better than this it would be interesting and instructive to hear about them.

Uniform Classification Proposed for Bus Pull-Ins

TO MEET the present need for a uniform method of recording the cause of equipment failures in bus operation, *Bus Transportation* suggests a classification of vehicle parts as a basis upon which to form a standard. The system of classification is flexible so that it can be made to serve the needs of large or small companies.

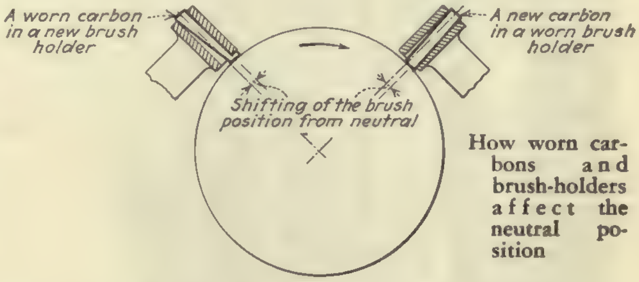
"Equipment failure" has been adopted as the designation for all kinds of failures on the road. The following definition was given:

> An equipment failure includes any instance where the bus fails to fulfill the run assigned without special attention or repairs, or arrives at destination more than five minutes late due to mechanical failure.

Effect of Worn Carbons on Motor Commutation

By John S. Dean
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

IN DIRECT-CURRENT railway motors the current must be led into the armature windings at definite points commonly called the neutral positions. These are determined by the throw of the leads of the armature coils and with some few exceptions this places the brushes along the center line of the main field coils. The brush-holders of most railway motors are permanently located in the neutral positions, which must always be maintained exactly in order to obtain the least sparking at the brushes.


A worn carbon in a new brush holder
A new carbon in a worn brush holder
Shifting of the brush position from neutral

How worn carbons and brush-holders affect the neutral position

The condition of the brush-holder boxes and carbons plays an important part in good commutation. If the motor brushes have developed considerable side wear, they may be shifted ahead as much as $\frac{1}{8}$ in., throwing them out of the neutral position by that amount. Further, if the inside of the carbon-way of the brush-holder is badly worn, even though a new brush is used, it may be shifted ahead about $\frac{1}{16}$ in. When a motor is operated with a combination of badly worn brushes in worn carbon-ways, the brush contact may be shifted ahead as much as $\frac{3}{16}$ in. from the neutral position. If the brush of a motor is shifted ahead of the neutral position or in the direction of the rotation of the armature, the commutation tends to become very poor. Inspection and brush renewals are essential to prevent the development of bad sparking, which may finally cause the motor to flash over and blow to ground.

Classification of Vehicle Parts for Equipment Failure Records

Engine and Related Units

(*Except Electrical*)

GROUPS 110 to 160

- 110. **Engine proper**
  - 111, *Shaft bearings*
    - (a) Rod
    - (b) Main
  - 112. *Piston pins*
  - 113. *Camshaft*
  - 114. *Valve mechanism*
    - (a) Cam followers
    - (b) Lifters
    - (c) Valves proper
    - (d) Rocker arm assembly
  - 115. *Oil system*
    - (a) Frozen engine
    - (b) Low pressure
    - (c) Gage
  - 116. *Gaskets*
    - (a) Head
    - (b) Other
- 120. **Spark plugs**
- 130. **Fuel feed**
  - 131. *Carburetor*
  - 132. *Gasoline system*
    - (a) Vacuum tank or fuel pump
    - (b) Gas line
    - (c) Gas tank
    - (d) Gage
  - 133. *Accelerator*
- 140. **Cooling system**
  - 141. *Radiator*
  - 142. *Water system*
    - (a) Water pump
    - (b) Hose connections
    - (c) Gage
  - 143. *Fan assembly*
    - (a) Fan and hub
    - (b) Belt
- 150. **Air system**
  - 151. *Compressor*
  - 152. *Tank, fittings and gage*
- 160. **Drive line** (to rear end)
  - 161. *Transmission*
  - 162. *Clutch*
  - 163. *Shaft*
  - 164. *Universals*

Chassis

GROUPS 210 to 240

- 210. **Springs**
  - 211. *Leaf*
  - 212. *Air*
- 220. **Steering gear**
- 230. **Axles and wheels**
  - 231. *Rear axle assembly*
    - (a) Differential
    - (b) Final drive
    - (c) Shafts
    - (d) Axle housing
  - 232. *Front axle*
  - 233. *Wheels*
    - (a) Bearings
    - (b) Wheel proper
    - (c) Rims
- 240. **Brakes**
  - 241. *Service*
  - 242. *Emergency*

Electrical System

GROUPS 310 to 330

- 310. **Main electrical units**
  - 311. *Generator*
  - 312. *Starter*
  - 313. *Battery*
  - 314. *Voltage regulator*
  - 315. *Heavy duty cable*
  - 316. *Ammeter*
- 320 **Ignition system**
  - 321. *Coil*
  - 322. *Distributor*
  - 323. *High-tension wiring*
- 330. **Body electrical units**
  - 331. *Lights* (Sub-divide according to circuits, if desired)
  - 332. *Horn*
  - 333. *Bells or buzzers*

Body and Accessories

GROUPS 410 to 420

- 410. **Body proper**
  - 411. *Doors*
  - 412. *Seats*
  - 413. *Other*
- 420. **Body accessories**
  - 421. *Windshield wiper*
  - 422. *Speedometer*
  - 423. *Fare box or register*
  - 424. *Heater*
  - 425. *Other*

Tires

GROUP 510

- 510. **Tire trouble**

Miscellaneous

GROUP 610

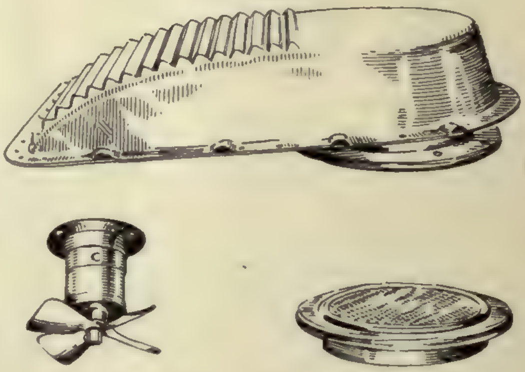
- 610. **Out of gas, oil or water**
  - 611. *Gas*
  - 612. *Oil*
  - 613. *Water*

Not Chargeable

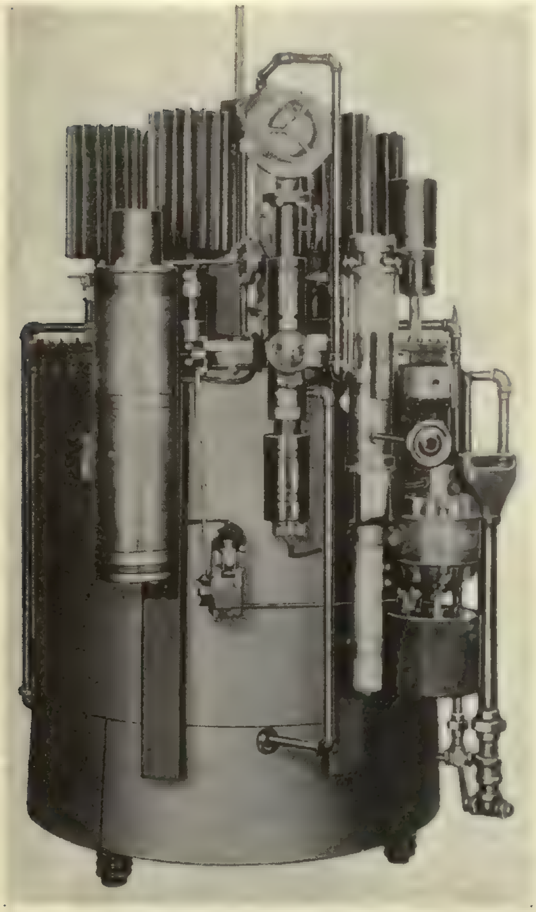
GROUP 710

- 710. **Not chargeable**
  - 711. *Accident*
  - 712. *Stuck in snow or mud*

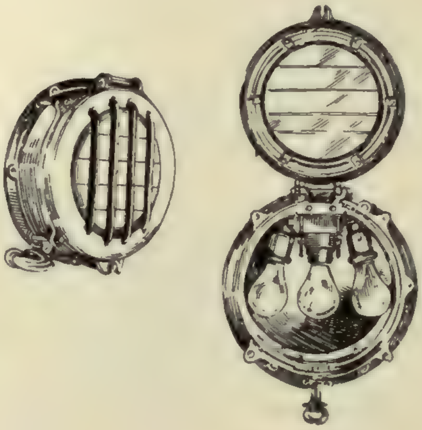
NEW PRODUCTS *for Use by* the Railways



Bus Ventilator consists of a top portion pressed from lead-coated steel designed to give maximum velocity of air, and a motor wound for 12 volts to which is attached a fan blade to exhaust the air at 160 cu.ft. per minute with the bus at rest, and 200 cu.ft. per minute at 10 to 15 m.p.h. The motor and fan are removable and replaceable by loosening two screws. *Manufacturer:* Electric Service Supplies Company, Philadelphia, Pa.

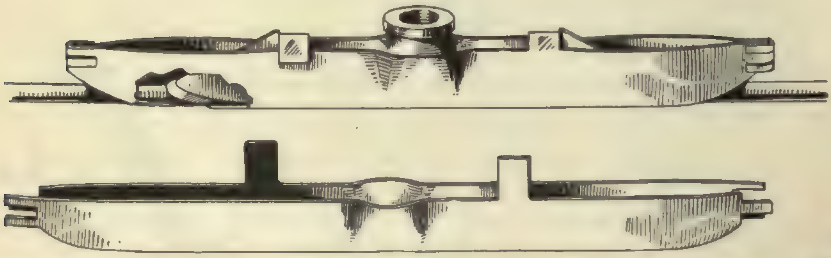


Steel Tank Mercury-Arc Rectifier is designed for the conversion of alternating to direct current over wide ranges of voltage and current. The rectifier consists of a mercury pool cathode and anodes inside a steel tank with facilities for condensing the mercury vapor, and the necessary auxiliary apparatus for maintaining the proper vacuum and temperature conditions. *Manufacturer:* Westinghouse Electric & Manufacturing Company.



Dash-Illuminating Headlight is recess mounted and employs an auto-type ray-deflecting lens that projects a diffused light well in front of the car. A circular side lens of Pyrex heat-resisting glass for illuminating the dash eliminates the need for additional lighting where dash illumination is desirable. *Manufacturer:* Ohio Brass Company, Mansfield, Ohio.

Gear and Pinion Puller can develop a force of 125 tons or 225 tons by means of a rachet wrench. A secondary rachet wrench can take up all the slack by developing a force of 15 tons. The power plant proper can be raised or lowered with the two wheels at the top to give a vertical adjustment of 10 in. *Manufacturer:* Clark Manufacturing Company, Bird Haven, Va.



Trolley Ear has been designed for use with renewable copper sheaths. The ear is of cast bronze metal, having lips that peen over the wire in the usual manner. The renewable copper sheath is attached to the ear by lugs, which are easily lapped over to form the locking position. The sheath can be renewed without disturbing the bronze ear casting. *Manufacturer:* Electric Railway Equipment Company, Cincinnati, Ohio.

NEWS *of the Industry*

Improvement Projects

Hopewell, Va.—The new rail and bus terminal being erected by the Petersburg, Hopewell & City Point Railway here is nearing completion. The building will add materially to the appearance of the business section. On the main floor will be waiting rooms for white and colored patrons and a modern and up-to-date lunch stand and magazine store. The restrooms will be on the second floor. The building represents an investment of more than $12,000.

◆

Providence, R. I.—The United Electric Railway has petitioned the Public Utilities Commission for permission to lay double tracks in that part of North Main Street between Benefit Street and Doyle Avenue. Authority has been asked also to install a double turnout in Manton Avenue, between Glenbridge Avenue and Raritan Street, and a single turnout on Manton Avenue between Florence and Joslin Streets.

◆

Vancouver, B. C.—The British Columbia Electric Railway has commenced a new track-laying project here on Granville Street. This work is all being done between midnight and 8 a.m.

Fare Changes

Jacksonville, Fla.—City councilmen have been petitioned to adopt a resolution asking the Council's Public Service Committee to negotiate with the Jacksonville Traction Company with a view toward establishment of a 5-cent zone fare.

◆

Baltimore, Md.—Mrs. Eva A. McGreevy has asked the Public Service Commission to direct the United Railways & Electric Company to reduce the number of fares from two to one between the city and Spring Grove Hospital, a state institution. She contends that many poor persons who go to the hospital to visit relatives are unable to pay two fares.

◆

Vancouver, B. C.—The city has decided against a survey of the British Columbia Electric Railway's system at an estimated cost of $35,000. Instead, the city's outside auditor will check the company's books preliminary to negotiations for a renewal of a three-year contract covering fares.

Bus Operations

Schenectady, N. Y.—The Public Service Commission has approved the action of the Schenectady Railway under its order of July 1 in substituting bus service for railway service between Schenectady and the village of Scotia, and in the towns of Rotterdam and Glenville.

(*Late News Continued on Page 432*)

414 Buses Now Used by Pacific Electric Railway

Growth of Operation at Los Angeles Recited by Official at Interstate Commerce Commission Hearing. Interesting Comparative Statistics

R. A. SMITH, passenger traffic manager of the Pacific Electric Railway, outlined before the Interstate Commerce Commission at Los Angeles some time ago, the reasons for the operation of motor coach passenger service by the Pacific Electric Railway and its affiliated organizations, also the extent of such operations. Operations of rail lines, as well as motor coach lines, comprise a service both between communities and cities, as well as a local or street car service within several cities and communities.

Effective May 10, 1917, by enactment, the California Railroad Commission was given control of motor coach lines to the extent among other things of requiring the securing from such commission of a permit of necessity and convenience for the operation of new lines, except where operation was entirely within the corporate limits of an incorporated city. However, such enactment permitted the continued operation of such lines as were operating in good faith prior to May 10, 1917.

Prior to the date of enactment, a number of independent motor coach lines competed with the Pacific Electric. In some cases such competition was by directly parallel lines, and in other cases competition was between important terminals, the routes traversing a different intervening territory.

Since May 10, 1917, no parallel operation by independents has been established in competition with the Pacific Electric, although a number of lines have been established between terminals, but run over what might be said to be non-competitive territory.

The Pacific Electric Railway felt that its rail lines were giving good service and at reasonable rates and should be protected, but the tremendous increase in population in the general territory served by its lines, together with the development of territory in districts a considerable distance away from established lines, offered very attractive fields for independent operators into newly developed territory, frequently in direct competition to existing lines of the Pacific Electric Railway. In order to protect the citizens and communities, using and depending upon a continuation of good service at reasonable rates, from an inferior service at higher rates, as well as to preserve its property and business the Pacific Electric Railway began to establish lines of its own. The first operation of the company was the purchase in 1917 of an independent motor coach line operating between San

(*Continued on Page 437*)

Coming Meetings

Aug. 6-8 — Pacific Claim Agents Association, Stockton, Cal.

Aug. 13 — Transportation Section, Wisconsin Utilities Association, Hotel Retlaw, Fond du lac, Wis.

Aug. 14—Annual Convention, Wisconsin Motor Coach Association, Hotel Retlaw, Fond du lac, Wis.

Sept. 9-10—Central Electric Railway Master Mechanics' Association, Cincinnati, Ohio.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Jan. 27-29, 1932—Electric Railway Association of Equipment Men, Southern Properties, Richmond, Va.

Coral Gables Went in for Municipal Ownership!

A plan for refinancing the entire bonded and floating debt of Coral Gables, Fla., has been agreed upon after a series of conferences with the City Commission, according to the Bondholders' Protective Committee. The entire debt is to be refunded by bonds and corporate stock bearing 6 per cent interest. The bonds will be due in 40 years. Provision will be made for amortization of the bonds beginning in the sixth year. It was deemed doubtful whether, prior to that date, the city can raise more than the interest charges, but if funds in excess of interest charges are raised during these years, the surplus is to be paid into a special account for the benefit of creditors.

The corporate stock is intended to permit creditors to benefit by any recovery on the part of the city from the present level. The obligations are payable solely from the corporate stock trust fund and the physical properties of the public utilities are pledged to this fund. The city also agrees to include in its budget a proper depreciation reserve for utilities in an amount to be agreed upon; and the premiums for insurance against liabilities incurred in the operation of the municipal street railway and bus lines and other utilities.

Bus Operations

(*Continued from Page* 431)

Pittsfield, Mass.—The Pittsfield Yellow Cab Company has petitioned the City Council for a franchise to operate buses on six routes at 5-cent fares in territory now covered by the Berkshire Street Railway with trolley service. The Yellow Cab had previously asked for a permit to run between Pittsfield and Dalton.

◆

Milwaukee, Wis.—Extension of the bus service of the Milwaukee Electric Railway & Light Company on Fond du Lac Avenue from the present terminus at North 60th Street to Hampton Road, in Wauwatosa and Granville, has been denied by the Public Service Commission. The extension was asked by 112 residents of the district affected. The commission found that the bus line was operated at a loss last year.

◆

Kansas City, Mo.—The Warwick bus route, downtown trunk line of the Kansas City Public Service Company, was discontinued on July 4, the buses, thoroughly overhauled, being placed on the Benton line. The Warwick line lost $165,000 in five years, and its revival is unlikely. The discontinuance leaves three downtown trunk lines. Fourteen Twin Coaches, ordered by the Kansas City Public Service Company in June, probably will be used to replace double deckers on the Armour-Paseo line.

◆

Beverly, Mass.—The Eastern Massachusetts Street Railway has been granted a permit to operate bus service from Centerville to the railroad station here at a 5-cent fare. Taxi drivers opposed the permit.

◆

Monroe, La.—Advisability of adopting trolley buses for use in the northern part of Monroe will be considered by the City Commission, which is in charge of the Monroe Municipal Railway, when it becomes necessary to remove street car tracks from Louisville Avenue to clear the right-of-way for the new traffic bridge across the river.

◆

Springfield, Mass.—The Springfield Street Railway plans to operate a bus line between Westfield and Springfield to supplant the present trolley system. Petitions have been filed with West Springfield Selectmen to cover the route in that town. The railway has made trial bus trips to ascertain better traffic approaches in Springfield.

Service Changes

Cincinnatus

A COLLEGE professor, driving through Kentucky, was kind to two strangers on the road. They desired a lift and he took them into his machine. Then, having him in their power, they killed and robbed him, drove off with his car.

Cincinnatus never picks anyone up, as much as he admires the exemplary act of Good Samaritan on the road to Jericho. The unhappy fate of the gentle college professor has been suffered also by others in these past years. The cautious motorist prefers loneliness to the company of strangers.

—*Cincinnati Post.*

Chicago, Ill.—Additional rail-air service is afforded North Shore Line customers in travel to points east and south of Chicago, under a hook-up with the Century Air Lines, Inc. This new service materially reduces the running time between the cities served. It supplements hook-ups already established with the National Air Transport, and the American Airways on the route formerly known as the Universal Air Lines. Under the new arrangements, direct service is operated between North Shore Line communities and Detroit, Mich.; Toledo and Cleveland, Ohio; South Bend, Ind., Springfield, Ill., and St. Louis, Mo. Schedules for the through trip to any of the cities embraced in the new hook-up are arranged by the North Shore Line ticket agents in the four cities.

◆

Seattle, Wash. — The Lake Burien street car service, long maintained by the Municipal Railway, has been permanently abandoned between White Center at the south city limits and the end of the line at Seahurst. Transportation will be handled by privately owned buses. According to railway officials, the Lake Burien service has been operated at a loss for several years. The Supreme Court recently approved abandonment.

◆

Laurel, Miss.—Crews of the Mississippi Power Company are engaged in tearing out the tracks of the interurban line between this city and Ellisville under an agreement made recently between the city of Ellisville and the company. Tracks are to be removed to the city limits of Laurel but service in the city is to be continued.

◆

Sydney, N. S.—The Public Utilities Board has been holding hearings here and in Halifax on the petition of the Cape Breton Electric Company, to be permitted to withdraw electric railway service in Sydney. The company's electric lines consist of 16½ miles of track within Sydney and 16½ miles of single-track line operated as the Sydney & Glace Bay Electric Railway. The reduction in the tram receipts are attributed to the increase in the use of the private auto, and to the introduction of so-called "jitneys" in Sydney and Glace Bay. The application to withdraw service is being opposed by the city of Sydney, but its plea for delay in the consideration of the matter has been rejected by the commission.

SPEED

is the Order of the Day and Age. Are you, Mr. Manufacturer preparing for the coming business revival? If not,

NOW IS THE TIME.

Don't neglect the

50th A.E.R.A. Convention

next September

EXHIBIT

your products. Meet prospective customers. Renew acquaintances. Make new friends. One week at Atlantic City with an exhibit will Speed business to your plant and Dollars to your treasury.

You are invited

THE EXHIBIT COMMITTEE.

◆

Los Angeles, Cal.—The Los Angeles Railway has been authorized by the Railroad Commission to reroute its motor coach line now operated along Mines Avenue and Whittier Boulevard.

◆

Memphis, Tenn.—Service on the Fair Grounds line of the Memphis Street Railway on Madison Avenue has been speeded up by the addition of more cars and the abolition of trailer trains. The morning service from 6 to 9 o'clock has been increased from a five to two-minute headway, as has the evening service from 5 to 7 o'clock. The midday headway on this line continues at six minutes.

◆

Marion, Ohio—The Columbus, Delaware & Marion Electric Company has petitioned the Ohio Public Utilities Commission for authority to file a new time schedule reducing from eight to four its railway round trips per day, between Marion and Bucyrus. The petition will be heard on July 29.

◆

Alliance, Ohio—Immediate abandonment of freight service between Canton and Salem by the Stark Electric Railroad has been authorized by the Public Utilities Commission. With the abandonment of the Youngstown & Ohio River Railroad and the partial withdrawal of service by the Northern Ohio Traction, the Stark Electric now has no outside connection.

◆

Birmingham, Ala.—Due to construction of underpasses for Twentieth Street, the Birmingham Electric Company has been forced to reroute several of its railway lines. On completion of the underpasses Twentieth Street will open a clear route with rail crossings eliminated. The maze of steam railroad tracks at grade on Twentieth Street, from Morris Avenue to Powell Avenue, has long constituted a tremendous handicap in maintaining railway schedules.

◆

Rockland, Me.—The Central Maine Power Company abandoned the 16-mile Rockland, Thomaston & Camden Street Railway on July 25. This route was built in 1892-93. Freight transportation was discontinued last August. Bus service may be substituted, but not by the Central Maine Power Company.

◆

Birmingham, Ala.—Prior to the recent opening of Birmingham's new municipal airport the question of handling traffic to and from the field became paramount. Since the rail lines of the Birmingham Electric end from 2 to 3 miles from the port, the situation was all the more acute. Happily a solution was found and put into effect. The Birmingham Electric Company has agreed to run buses from their lines on regular schedule. It is expected that eventually this 615-acre airport will be served by trolley and bus.

$500,000 Milwaukee Project Started

Construction will be started immediately on the Lakeside belt line, a 6-mile electric railway project of the Milwaukee Electric Railway & Light Company through parts of the towns of Lake and Greenfield. All contracts for grading, concrete work and steel fabrication are being placed with Milwaukee firms, and it is specified that local labor be employed exclusively. The estimated cost of the project is $500,000.

Grading contracts have just been awarded to four firms, which will proceed simultaneously on as many sections of the job. In the meantime, several Milwaukee structural steel firms will fabricate the bridges, and other contractors will place the concrete bridge abutments.

The plan is to complete the grading, concrete and bridge work by early winter so that the new roadbed can settle during the winter. Track laying is expected to be done next spring.

The new line will run east and west just south of and parallel to Howard Avenue. It will connect the present Lakeside belt line near South Sixth Street, with the company's main rapid transit system at a point west of Woodlawn Avenue.

The line will be entirely without grade crossings. The right-of-way on which this railway is to be built is of sufficient width to accommodate electric transmission lines to provide needed additional outlets for power generated at the Lakeside power plant.

Insull's Indiana Properties Co-ordinated

Operation of the Terre Haute, Indianapolis & Eastern Traction Company as a subsidiary of the Midland United Company, an Insull holding company, was begun at midnight on June 30 by Elmer W. Stout, receiver. Approval of the sale of the properties to B. P. Shearon, secretary of the Midland Company, at a foreclosure sale held in Indianapolis on June 23, was given on June 29 by Judge Ryan of Marion Superior Court. The purchase price was $2,500,000.

Actual supervision of the operation of the T.H.I.&E. properties was taken over July 1 by Indianapolis executives of the co-ordinated Insull management. Henry Bucher, vice-president of the Indiana Railroad and operating chief of other lines comprising the Indiana Railroad System, has been appointed railway executive for the T.H.I.&E. properties, and other officials of the co-ordinated lines have been assigned to similar positions on the T.H.I.&E.

The Indiana Railroad petitioned the Public Service Commission on July 2 for authority to acquire the interurban lines formerly owned by the T.H.I.&E. between Indianapolis and Brazil, between Indianapolis and Richmond and between Dunreith and Newcastle, and the city railway system in Richmond.

The Public Service Company of Indiana, another subsidiary of the Midland United Company, simultaneously asked permission to acquire all electric light and power facilities controlled by the T.H.I.&E. as well as the street railway system in Terre Haute and interurban lines between Terre Haute and Brazil and between Terre Haute and Paris, Ill.

Although the receiver now has pending before the commission a petition to abandon the 62-mile Terre Haute, Indianapolis & Eastern's eastern division from Indianapolis to Richmond, he has proposed in an amended petition a new route which would be over the Indiana Railroad line from Indianapolis to Newcastle, thence over the T.H.I.&E. spur line from New Castle to Dunreith and over the T.H.I.&E. eastern division from Dunreith to Richmond. Thus, only that part of the eastern division from Indianapolis to Dunreith, or about 39 miles of track, would be abandoned. The proposed route between Indianapolis and Richmond would be about 18 miles longer. The city of Greenfield recently protested against the proposed discontinuance of service. The T.H.I.&E. car shops are located at Greenfield.

Program of Entertainment for Atlantic City

Guy C. Hecker, general secretary of the American Electric Railway Association, urges all chairmen of subcommittees to turn in any copy matter intended to be included in the printed program for the meeting of the association at Atlantic City Sept. 26 to Oct. 2. Attention is also directed by Mr. Hecker to the fact that copy matter for any special signs desired is to be in the hands of the director of exhibits at least 24 hours before the signs are to be used, with instructions as to when, where, and to whom, such signs are to be delivered. He also reiterates the fact that the chairman of all sub-committees are to meet with the general chairman, at the office of the director of exhibits at 7 p.m., Sunday, Sept. 27. As developed up to this time the program of entertainment is as follows:

Golf tournament, Sunday.
Ladies tea, Monday afternoon.
Ladies musicale and tea, Tuesday afternoon.
Ladies tea, Wednesday afternoon.
Ladies tea, Thursday afternoon.
President's reception, Monday night.
Formal dance, Thursday night.
Informal bridge Monday afternoon.
Informal bridge, Tuesday afternoon.
Ladies bridge tournament, music, Wednesday afternoon.
Informal bridge, Thursday afternoon.
Advisory council, Tuesday night.
Special entertainment, Wednesday night.

Agitation to Make Binghamton All Bus

The Common Council of Binghamton, N. Y., plans to hold a public hearing upon the question of substituting bus transportation in Binghamton for trolley cars to ascertain the wishes of the people of the city. Alderman Chubbuck, who proposed the resolution, said the move was suggested by reports that such action would be recommended by the City Planning Commission. Should opinion, as expressed at this hearing, favor the change the matter will then be taken up officially with the Triple Cities Traction Corporation.

General Manager Burley, of the Triple Cities Traction Corporation, said the company is willing to co-operate in every possible way with city officials and the public at large to improve transportation service. As far as he could now see, without extensive investigation, the company would have little to gain in a financial way since to change to buses on all lines, it would be necessary to purchase a large number of buses. Upon the main lines, it would be necessary to install all new equipment and he has no idea of the number which would be required properly to handle the passengers now carried by trolley. Even taking into consideration the probable saving in paving taxes, the actual saving would be more apparent than real. Without having made any investigations, Mr. Burley estimates the cost of making the change and the purchase of new equipment would be $750,000.

"Mayor Walker Might Well Smile Sardonically"

Postponement of rapid transit unification in New York for at least another year is recommended in a report submitted to Mayor Walker by a subcommittee of his Committee on Taxation. The report urges that steps be taken at once to provide a competent operator, under a lease or contract, to run the new Eighth Avenue subway line which is expected to be ready for service in December.

As the New York *Times* sees it, the appeal of the Mayor's Committee on Taxation to go slow with subway unification sounds very much like urging the turtle not to rush ahead and beat the hare. The *Times* does not think that any one can accuse the unifiers of having been precipitate. For months and even years they have gone forward, if at all, only at a snail's pace. With all of Mr. Untermyer's energy and drive and ability to get competitors to agree, he was able to work out his plan of unification only after efforts kept up through several years. Since his withdrawal as special counsel to the Transit Commission, that body, working in harmony with Chairman Delaney, was supposed to be moving rapidly ahead with a unification plan of its own. It was to have been presented to the Board of Estimate on July 21, but unexplained delays occurred and presentation has been put off for a month. The *Times* says: "This is fully in line with the hope deferred which has marked, over long periods, all the stages of the transit negotiations. Mayor Walker might well smile sardonically when asked not to allow the affair to be hurried."

Co-ordination Under Constant Study in Newark

Public Service Co-ordinated Transport has no present intention of going along with the suggestion that it take the cars off the streets of Newark, N. J., between 10 a.m. and 4 p.m. According to the Newark *News*, it does, however, intend, with the completion of the City Railway, to work out a system under which between 35 and 40 per cent of the trolley trips will be off the streets downtown. Buses will handle short-haul traffic on streets where trolleys no longer run.

As a part of the changes now under way, bus lines are being shifted to streets parallel to trolley line streets as a means of better co-ordination of facilities. It is regarded as economically unsound, as well as unnecessarily congesting traffic, to operate buses and trolleys on the same streets.

When City Railway is ready for operation under lease by the city to Public Service, trolley cars from many lines will use it. Cars eastbound on Warren Street, Central Avenue, Orange Street and Bloomfield Avenue will dip into the new subway line at the intersections of those thoroughfares and the railway and proceed to the Pennsylvania Railroad Station.

Mitten Estate Is to Be Turned Over to P.R.T.

Dr. A. A. Mitten has turned over to the Philadelphia Rapid Transit Company virtually the entire estate of the late Thomas E. Mitten, to which he was sole heir. The estate is valued at close to $1,000,000.

As indicated in ELECTRIC RAILWAY JOURNAL NEWS for June 18, the announcement was made by John A. McCarthy, vice-president of the Real Estate Trust Company, and one of the six directors named to the P.R.T. by Judge McDevitt, following surrender of Mitten Management, Inc., in the city's equity suit on May 11.

All assets of Mitten Management, Inc., also have been placed at the disposal of P.R.T. by Dr. Mitten. Mr. McCarthy made a statement in which he said:

> As nearly as can be now ascertained, the liquidation of the estate will result in approximately the payment of $1,000,000 to P.R.T., subject to annuities to seven annuitants of $3,000 each.
>
> The estate also owns 70 per cent of the stock of Mitten Men & Management, Inc., the remaining 30 per cent is the personal property of Dr. A. A. Mitten, son of Thomas E. Mitten. Whatever assets there are in Mitten Men & Management, Inc., remaining after the payment of the obligations of that corporation will also be turned over to P.R.T. From such investigation as the committee in charge has been able to make of Mitten Men & Management, Inc., it is not believed that these assets will pay an appreciable dividend to P.R.T.

Dr. Mitten's letter to the P.R.T. board turning over the Mitten estate to the P.R.T. follows:

> There is one class of readjustments contemplated by Judge McDevitt's adjudication for which I want to ask the attention of the board in the hope that prompt disposition of them may be made.
>
> As to a number of past transactions, the adjudication holds that Mitten Management or the Mitten estate may be held surchargeable by P.R.T. The original decree nisi entered by Judge McDevitt called for the appointment of receivers, who were to have full authority over all such surcharges, and under Paragraph 3 of the decree were authorized:
>
> "To institute suits at law or in equity for the recovery of any estate, property, damages or demands existing in favor of the said Philadelphia Rapid Transit Company, and in their discretion to compound and settle with any debtor of the company, with persons having possession of its property, or in any way responsible at law or in equity to the Philadelphia Rapid Transit Company, upon the terms and in such manner as they shall deem just and beneficial to the Philadelphia Rapid Transit Company."
>
> In presenting to Judge McDevitt the revised plan, whereby directors were substituted for receivers, one of the moving grounds was the offer on behalf of both Mitten Management and the Mitten estate to place all of the assets of both at the disposal of the reorganized board. In this connection, Senator Pepper, speaking for all defendants in presenting the plan to Judge McDevitt in open court, stated:
>
> "We hope that under the plan now outlined all constructive results can be obtained without adverse action. All the Mitten assets, including those of Mitten Management and of the Mitten estate, are in fact and in law the assets of Dr. Mitten. By his statement, made public immediately after the probate of his father's will and now repeated, through me, in open court, all of those assets in any way related to the P.R.T. situation are pledged and will be applied to the strengthening of P.R.T. in such way as the reorganized board of directors and the court shall approve. This statement is subject only to the qualification that there are a few small legacies or annuities under the will which the court will no doubt desire to protect."
>
> The plan as presented by Senator Pepper was accepted by the court on May 13, 1931, and by order of that date the decree nisi was modified, but only "so far as relates to the appointment of receivers."
>
> For both Mitten Management and the Mitten estate, I hope very much that the board will take up promptly the question of the disposition of the assets thus placed at their disposal in settlement of the suggested surcharges under the authority of Paragraph 3 of the decree nisi and as contemplated in Senator Pepper's presentation of the plan. If the board will designate the committee or representatives whom it wishes to go into this matter, I will be glad at once to lay before them detailed analyses of the assets and present worth of both Mitten Management and the estate.

Financial News

Philadelphia, Pa.—A majority of the 15,000 employees of the Philadelphia Rapid Transit Company have voted down a proposal that the trustees of the P.R.T. Wage Fund pledge the latter's assets to permit payment of the usual 3½ per cent wage fund dividend on Aug. 15.

◆

Buffalo, N. Y. — The International Railway has deeded its roadbed, tracks, poles and wires in Lancaster to the village and given $5,000 toward their removal and for paving. The village board had recommended to the Public Service Commission that the I.R.C. be permitted to abandon the line. The trolleys ceased operation two months ago. They have been replaced by buses. When the tracks in Sawyer Avenue have been removed and the bed paved, another highway will connect Lancaster and Depew.

◆

Charlotte, N. C. — Purchase of the Plaza Railway Company's short line here for $8,000 by the Southern Public Utilities Company has been announced. The Plaza company operates the street car service over about 2 miles of track through the populous Plaza section of Charlotte. The transaction terminated negotiations which have been in progress several weeks. It ends the receivership ordered a few days after the death of H. B. Heath, wealthy Charlotte business man and executive head of the Plaza company.

The Business Outlook

DESPITE disappointment regarding the default of decisive measures to meet the European crisis, there are signs of slight strengthening in the domestic business situation. Business opinion is apparently responding to symptoms of domestic convalescence reflected in replacement demand at prevailing low prices and the rapid rise in electric power production since early June. Commodity price levels have shown stability for six weeks. Second quarter earnings reports reflect increasingly successful readjustment of corporate operations to new conditions. The construction, equipment and correlated industries still lag but persistent, large-scale pressure toward lower long-term domestic money costs, through aggressive Federal Reserve open market policies, could correct this situation and speed recovery.

—*The Business Week.*

Regulation and Legal

Washington, D. C. — Exercising authority granted by Congress last session, the District of Columbia Public Utilities Commission has ruled that interstate buses must provide off-street loading facilities in some section removed from the congested downtown area so as to do away with the loading and unloading of passengers along the streets in the business district. The new ruling will not go into effect until Aug. 1, 1932.

◆

Columbia, S. C.—Attorneys who conducted the prosecution of the Columbia Railway, Gas & Electric Company and secured a ruling requiring the company to restore transportation service here, are seeking to have the company pay the legal costs in the four-year fight. The South Carolina Supreme Court authorized Referee Perrin to hear their contentions.

◆

Richmond, Va.—Bus lines licensed through the State Corporation Commission must meet the same general liability requirements as for-hire vehicles licensed through the division of motor vehicles. So H. Lester Hooker, member of the commission, has ruled. Mr. Hooker stated that buses are required to post $10,000 liability bond or insurance and trucks $5,000, and that the conditions surrounding the liability protection are identical with those of for-hire vehicles. According to him, under the new law, which became effective on Jan. 1, it is mandatory that the commission require either insurance or bond with surety to be filed with and approved by the commission. Under the old law the commission could waive bonds, but the new law does not permit any discretion.

◆

Columbus, Ohio—The Eastern Michigan Railway has been ordered to continue operation of its interurban line from Toledo to the Michigan-Ohio boundary until authority to discontinue is given by the Ohio Public Utilities Commission, which says the railroad had not filed an application for abandonment either with the state commission or the Interstate Commerce Commission.

◆

Washington, D. C.—The Public Utilities Commission has denied the petition of the people's counsel for a rehearing of the school children's 3-cent car fare case. At the same time, the commission directed its counsel to prepare an answer to the appeal from the commission's order filed in the District Supreme Court by the Washington Railway & Electric Company, the Capital Traction Company, and the Washington Rapid Transit Company.

◆

Atlanta, Ga.—Constitutionality of the Georgia license tax law on buses and trucks in intercity operations has been upheld by Judge Howard, in Fulton Superior Court. The operators attacked the law on the grounds that it was not uniform and was discriminatory. In his decision, Judge Howard said he was "not altogether free from doubt in regard to one or two grounds of attack, but in cases of doubt the law makes it my duty to decide in favor of constitutionality." The decision may be appealed to the Supreme Court.

Ordinance Against One-Man Cars Restrained

A temporary injunction restraining the city of Atlanta from putting into effect an ordinance forcing the Georgia Power Company to put a motorman and conductor on the street cars of that city has been signed by Judge Underwood, of the Federal District Court. Judge Underwood issued an eight-page opinion in which he said he was impelled to approve the application for temporary injunction because failure to grant such an order was likely to cause "irrecoverable loss."

No date for hearing on the permanent injunction has been set.

City Council passed the ordinance on May 7, specifying that street cars be operated by two men within the city fire limits, "in the interest of public safety and speed." The injunction suit attacks the ordinance as unconstitutional and amounting to confiscation of railway property.

Taxi Fares Increased in San Francisco

The San Francisco Board of Supervisors passed to print July 13 an ordinance setting minimum and maximum rates to be charged by taxicab operators. The new minimum rate will be 15 cents for the first quarter mile, and 10 cents for each additional two-fifths mile, with a charge of 10 cents for the trip for each passenger more than one. The minimum rate also includes a charge for each 2½ minutes of waiting time. Previous to this the average minimum rate has been about 30 cents for the first mile. The charge for additional passengers is also a new feature, as five have been able to ride for the price of one. The maximum fare is 25 cents for the first quarter mile, with 10 cents charged for each additional one-fifth mile, 25 cents for each passenger over one, and 10-cent charge for every two minutes of waiting time. It is hoped that through this increase in the rate charge the wage situation, particularly the $5 a day minimum for operators, will prove self-correcting.

Relief Proposal Before Omaha

A hearing on July 13, before the Omaha City Council resulted in a decision to have City Attorney Moriarty draw up various ordinances relating to the proposals of the Omaha & Council Bluffs Street Railway for the elimination of the company's occupation tax and for relief from paving burdens, and to invite the public to take part in full discussion of them before any action is taken.

Officials of the tram company state that the purpose of the occupation tax, first imposed nineteen years ago, was to divert part of the profits of the company to the city, but that now there are no profits and therefore the tax is unjust.

J. N. Shannahan, president of the railway, said:

> We must have immediate relief either through elimination of the special taxes or by an increase in fares. This relief must come this year or the company cannot avoid a receivership. We do not want to increase fares, therefore we have asked the Council to submit to the voters the question of eliminating the occupation tax and the paving tax.
>
> It is necessary, however, that the question be decided soon. We cannot wait for the next general election in 1932. If the Council decides not to submit the question or the people vote it down, the alternative is application for higher fares.

City Attorney Moriarty stated that legally the people cannot decide by vote whether the tax is to be eliminated. He said:

> This would have to be done by action of the City Council, but of course the Council can submit the question to a vote of the people in order to get the popular sentiment.

Car Design Progress Program Fully Outlined

At the call of the chief engineer of the Electric Railway Presidents' Conference Committee, a number of leading electric railway equipment engineers, constituting the equipment advisory committee of that organization, met at New York recently. This committee will constitute one of several groups which will act in an advisory capacity to C. F. Hirshfeld, chief engineer for the Presidents' Conference Committee, the program of which calls for the development of a more generally acceptable type of low-cost car.

Mr. Hirshfeld outlined the program which had been organized under his direction to carry out the committee's objectives.

According to the organization chart Mr. Hirshfeld displayed, there are to be two manufacturers' advisory committees, one composed of car builders and one of electrical manufacturers. Two more manufacturers' committees will be organized later if it is found advisable. One of these will consist of air brake manufacturers and the other of the manufacturers of miscellaneous appliances which enter into the construction of street cars. Provision is also made for two committees to be chosen from the ranks of operating companies. One of these, the Equipment Advisory Committee, composed of operating men, has already been selected, being the group in attendance at the meeting, supplemented by several others who were unable to be present. The other advisory committee will consist of men interested primarily in transportation problems.

These committees are to undertake parts of the program and offer ideas and suggestions of value.

On the chief engineer's staff, provision is made for an engineer in charge of the collection of data, an engineer in charge of analytical work, and an engineer in charge of tests and experiments, together with necessary assistants and consultants. The work now underway includes the collection of existing information and statistics relating to the performance of present equipment, as well as the collection of new information and data, and the analytical study of factors effecting car design and performance.

Among the subjects to be studied are design factors as affecting first cost, maintenance, life, appearance, etc.; structural strength, starting resistance and acceleration, power requirements, riding qualities, noise reduction, safety features, ventilation and heating, and lighting, legislation affecting car design and operation, fare collection, loading and unloading practices and the esthetic appeal of car design.

Following the regular meeting those in attendance were taken by bus to Brooklyn, where the field laboratory, which has been made available through the courtesy of the Brooklyn & Queens Transit Corporation, was inspected.

Engineers Favor Buses for Some Columbia Routes

The special board of engineers appointed by the Supreme Court to inquire into the transportation needs of Columbia, S. C., favors buses over street cars in Olympia and Shandon. Its recommendations are substantially the changes sought by power company attorneys. The board suggests that buses be operated by the Columbia Railway, Gas, & Electric Company on Olympia Avenue and Whaley Street in the Pacific mills community and on Divine Street from King to Heath's corner.

Attorneys for the transportation company and Broad River Power Company submitted the request for authority to substitute buses for street cars at the last court term in conjunction with favorable petitions from dwellers in the affected area.

Meanwhile, authority has been asked by the company to charge extra fare on the proposed bus line between Heathwood and the location of the veterans' hospital farther down the Garner's Ferry Road.

Five-Cent Zones in Gary

Short-haul 5-cent fare zones were placed in effect for a 30-day trial period on five divisions of the Gary Railways, Gary, Ind., on July 26. One zone is in effect in the city of Hammond between Subway Road, east of the city, and the end of the line at the Nickel Plate tracks in downtown Hammond. Another short-haul zone is established on the Indiana Harbor division between 145th Avenue junction and Michigan and Guthrie Streets, the end of the line in central Indiana Harbor.

Decision to establish other short-haul 5-cent fare zones was made following a test of the low rate for a month on Broadway between Twentieth Avenue and North Broadway loop.

Seattle's New Mayor to Tackle Railway Problem

Robert H. Harlin, newly elected Mayor of Seattle, Wash., succeeding Frank Edwards, recalled, announces that the most perplexing problem confronting the city administration is the future of the Municipal Railway. Mayor Harlin was formerly a member of the city utilities committee, which has in hand the city railway problem, and he stated that he will co-operate to the fullest extent with the committee.

The position of superintendent of utilities, from which George B. Avery resigned, upon request from the new Mayor, has not been filled. Mayor Harlin states that since this position entails the operation of the Municipal Railway, it is extremely important, and he is withholding appointment until the Council has determined whether or not a position of manager of street railways, with such broad powers as are necessary, may be substituted for the public utilities head. Meantime, E. A. Pierce, first assistant superintendent of utilities, is in charge of the department. Mayor Harlin said:

> The need of the municipal railway is to bring the cost of operation within the revenues, leaving a margin to be paid on principal and interest on bonded indebtedness in an amount mutually satisfactory to the city and the bondholders. In my mind, this entails an expert survey first to determine the needs and second to do those necessary things developed in the survey.

New Wage Policy Is Announced for Brooklyn Men

Company officials announced on July 18 a new wage policy which will affect about 10,000 men in the employ of the Brooklyn-Manhattan Transit Corporation, but they declined to estimate the annual saving involved. The entire schedule of wages and hours, upon which the new policy will be based, will be incorporated in a new one-year agreement to supersede the two-year contract which will expire on Aug. 1. The official statement follows:

> The existing two-year arrangement with employees of the B.-M.T. system with reference to wages and working conditions expires in August of this year, and the arrangement for the coming years has been under discussion with the representatives of the respective groups of employees during the last three or four weeks, and a definite understanding has been reached with practically all of the groups of employees, including motormen, both on rapid transit and surface lines.
>
> The arrangement agreed upon with the representatives with reference to employees now in service involves no reduction in the hourly rate of wage for the respective classes of work, but changes have been made in working conditions so as to change the regulation with reference to bonus allowance, reducing maximum bonus allowance and also reducing for some classes of employees the hours worked per day and hours worked per week so as to continue to furnish employment to as many employees as possible.

At present surface car motormen receive 65 cents an hour and trainmen on the subway and elevated lines 60 cents an hour. They receive the $5 bonus for each 30 days of operation unmarred by accident. The halving of this bonus, it was estimated, would cut the wages of all motorman, trainmen and conductors, excluding subway and elevated motormen, by one cent an hour.

The basic eight-hour day is to be retained, but several classes of employees will have their working time cut several hours a week. The company, it was said, had made it clear to representatives of the men that reduced hours offered the only alternative to laying off a large number of employees.

The subway and elevated motormen are, for the most part, members of the Brotherhood of Locomotive Engineers. Their agreement with the company, it is understood, will not be affected by the new policy.

Regulation and Legal

(*Continued from Page* 434)

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company has asked the Wisconsin Supreme Court to reconsider its recent decision under which the company was ordered to cease running freight cars over North Fifth and North Sixth Streets on its Milwaukee northern division. The carrying of freight over the city streets was protested by residents before Common Council committees, but the Circuit Court decided in favor of the company. The Supreme Court reversed the lower court's decision. At present, the company is allowed to carry package freight in the vestibules of passenger cars, but is not allowed to run cars for the exclusive use of freight, a right it contends its franchise carries.

Indianapolis, Ind.—Recognition of railroads as heavy taxpayers and entitled to protection against truck invasion of freight routes was given in an order issued June 23 by the Public Service Commission. The policy was outlined in an order denying the petition of the Drake & Houk Transfer Company, Winchester, to operate a freight truck line between Winchester and Portland in competition with the Pennsylvania Railroad.

◆

Rochester, N. Y.—By unanimous action, the City Council has passed an ordinance which authorizes City Manager Stephen B. Story to extend for one year the subway railroad agreement between the city and the New York State Railways dating from Aug. 1. At a previous meeting of Council, the service-at-cost contract, covering the surface and bus lines, was extended for a year.

◆

Richmond, Va.—Objections of Virginia bus companies to the proposed rule of the commission forbidding intrastate lines selling or honoring tickets over interstate lines and banning interline agreements between State and interstate bus carriers have been taken under advisement by the State Corporation Commission.

◆

Chicago, Ill.—Commissioners of Lincoln Park are endeavoring, through the Illinois Commerce Commission, to compel Chicago Surface Lines to remove its tracks from Lake Shore Drive between Chicago Avenue and Ohio Street. Numerous civic clubs, appearing before the commission, say this line is of great convenience to residents of the west side in reaching the municipal pier. The commission is also considering the petition of the Northwest Business Men's Association that the company extend its trolley but line west on Diversey Avenue.

◆

Madison, Wis.—Removal of the street car tracks of the Madison Railways on Regent Street has been approved by the Council's Street Committee. The tracks have been unused since bus service to the cemeteries was substituted for railway service several years ago.

General

Detroit, Mich. — The civil service system to be installed in the administration department of the Detroit Municipal Railway will include all department heads except General Superintendent Del A. Smith.

◆

Boston, Mass.—The 22d convention of the Amalgamated Association of Street and Electric Railway Employees will convene here on Aug. 24 and continue in session until the work of this convention is completed.

◆

Seattle, Wash.—A new magazine is being created to take the place of the *Puget Sound Electric Journal*, and to surpass it. Puget Sound Power & Light Company officials felt that a house organ more nearly typical of the things which the company is accomplishing and hopes to accomplish, was needed. So the *Puget Sound Electric Journal* was "put to bed" for keeps. A prize of $25 will be awarded to the employee of the company who submits the name selected by a committee of executives as being most suitable for this house organ.

Springfield, Mass.—H. M. Flanders, general manager of the Springfield Street Railway, announces two prizes for the best 500-word article or story by an employee on the subject: "How I Can Increase the Company's Revenue." The first prize will be a cash award of $10, and the second a cash award of $5. The contest ends July 31. The nine members of the Safety and Service Committee have agreed to act as judges. Their decisions will be final.

◆

Columbus, Ohio. — The Columbus Railway, Power & Light Company has formed an organization intended to foster co-operation and maintain at a high standard the spirit of fellowship and good will among the foremen of the company. Charles E. Hammon is president.

◆

Philadelphia, Pa.—In discussing editorially the one-man car decision in the Brooklyn case and in drawing a parallel between experience there and in Philadelphia the *Ledger* said that passengers will continue to complain that the one-man cars are inconvenient, but the operators have thus far been able to show that the advantages of their use overbalance any legitimate objections.

◆

Seattle, Wash. — Property valuations have been fixed by the State Tax Commission subject to review before the State Board of Equalization at its regular valuation hearings next September. Street railway valuations lowered were the Seattle & Rainier Valley Railway, reduced from $700,000 to $630,000; Grays Harbor Railway & Light, $150,000 to $140,000; Spokane United, $2,000,000 to $1,750,000; Tacoma Railway & Power, $1,850,000 to $1,700,000. Valuation of the Pacific Traction Company remained the same, $50,000. Five interurban railways were assessed $1,479,600, one, the Twin City Railroad, receiving a cut from $15,000 to $13,500. The unchanged valuations of the other four were: Spokane, Coeur D'Alene & Palouse, $1,000,000; Portland Electric, $6,100; Walla Walla Valley, $110,000, and Yakima Valley Transportation Company, $350,000.

◆

Baltimore, Md.—A number of drivers of Sun Cab Company vehicles went on strike on July 20, a spokesman for the men declaring that they did so in protest against paying $6 a day rental for the cabs. He said they want this charge cut to $5. Officials of the company declared only a few of the men had given up their jobs.

◆

Birmingham, Ala.—Trainmen of the Birmingham Electric Company have devised a plan whereby every man holding a regular run, regardless of seniority, would voluntarily lay off one day in every ten days. This action has resulted in every trainman being able to make a minimum number of hours each week. The "extra board" remains intact.

◆

Louisville, Ky.—The Indiana Railroad System used large newspaper advertising on July 18, to invite the public in Louisville to inspect its new type interurban car on display at the Traction Terminal Building here on July 20 and 21. The company spent $980,000 for new equipment, described previously in ELECTRIC RAILWAY JOURNAL.

Proposed Rome Substitution

The City Commission of Rome, Ga., by a unanimous vote, has rejected the petition of the Georgia Power Company to discontinue the street car service and substitute buses, and has decided to see what legal steps can be taken to compel the pavement of the car area on East Ninth Street by the power company. The vote to disallow the petition to substitute buses was based on an opinion by G. E. Maddox, special attorney for the city, in litigation with the company. Mr. Maddox held that to grant such a request would endanger the future transportation facilities in the city and that the State Supreme Court has ruled that the power company cannot abandon its service piecemeal—that the street car and power and light franchises are one and the same.

The position of the company is that it has always conducted its railway business in Rome separate and distinct from its electric light and power business and that this condition of separate operation was true when the two separate and distinct businesses were owned and conducted by its predecessors. The company does not believe it can legally or constitutionally be compelled to continue to operate its railway lines in Rome and vicinity when it not only receives nothing whatever on the property used and useful in performing such service, but monthly and yearly incurs an actual operating loss in rendering this service. It holds that to compel service under such conditions, its property is being taken without due process of law in violation of the fourteenth amendment.

◆

Referendum on Taxi Bill

W. Preston Lens, Jr., attorney-general of Maryland, has ruled that the petition for a referendum on the taxicab bill passed by the last session of the Maryland General Assembly conforms with law, and it will therefore be passed upon by the voters. The bill was signed by the Governor. It is designed to place the taxicabs of Baltimore under the supervision of the Maryland Public Service Commission, effective on Jan. 1, 1932. The petition will prevent it from going into effect at that time. The vote will be taken at the Congressional election next year.

Pacific Electric Bus Operation

(*Continued from Page* 431)

Bernardino and Highland which competed directly with a rail line. Extensive operation of motor coaches did not commence until 1923, a year of great activity in residential building. Lines were established to ward off competition and also to run into newly developed territory as feeders to rail lines.

In 1923 the Los Angeles Railway, operating an extensive rail system in Los Angeles, and the Pacific Electric Railway were confronted with extensive, direct motor coach competition by an independent operator. In order to forestall this threatened competition, the Los Angeles Motor Coach Company was organized, and motor coach lines were established. While to a certain extent this operation is competitive with the rail service of the Los Angeles Railway and the Pacific Electric Railway it serves in a general way to connect districts of Los Angeles with a direct or crosstown service. Los Angeles Railway and Pacific Electric Railway each purchased one-half of all equipment and facilities of the Los Angeles Motor Coach Company and each shares one-half in revenues and expenses, but a separate operating organization is maintained. In 1924 ownership of motor coach lines operated by the Pacific Electric Land Company was transferred to the Pacific Electric Railway.

Motor Transit Acquired

During a period of several years there had grown up in southern California in the territory served by the Pacific Electric Railway an extensive system of motor coach lines, known as the Motor Transit Company, giving service to a large extent competitive with that of the Pacific Elecric Railway particularly between important cities and towns, although much of the route of many lines operated is through non-competitive territory. The Motor Transit Company was operated as an extensive feeder to Pacific Greyhound Lines, Inc. On Jan. 1, 1930, Pacific Greyhound Lines, Inc., purchased one-third of the capital stock of the Motor Transit Company, the Pacific Electric Railway purchasing the other two-thirds of the capital stock. Service of the Motor Transit Company is being co-ordinated with that of the Pacific Electric Railway rail and coach lines, with joint tickets and optional use of either line between common points.

Motor coach operations of the Pacific Electric Railway directly and through affiliated organizations, include several lines operated as protection against competition, lines operated as feeders in newly developed territory, and also lines to territory not adequately served by other rail or motor coach lines. In a few instances where rail lines needed to be rebuilt and where traffic has been comparatively light, motor coaches have been substituted.

In Pasadena the Pacific Electric Railway operates a completely co-ordinated and unified system of local motor coach and street car service.

The Pacific Electric Railway has 141 motor coaches in operation; Los Angeles Motor Coach Company, 148 coaches; Motor Transit Company, 125 coaches; making a total of 414 coaches under operation by the Pacific Electric Railway and affiliated organizations.

Climatic conditions at Los Angeles are particularly good for the operation of automobiles, and roads and highways have been constructed commensurate with their very extensive use. The ratio of automobiles to population in the southern part of California is greater than in any other section of the United States. Of the total competition afforded by both private automobile and passenger motor carrier, Mr. Smith estimated that at least 85 per cent of such competition is due to the private automobile and 15 per cent to the passenger motor carrier.

Passenger Motor Coach Operations of Los Angeles Motor Coach Company, Years 1923 to 1930 Inclusive, of Pacific Electric Railway

Year	Total Passengers	Total Miles	Total Revenue	Revenue per Coach-Mile, Cents
1923..........	911,052	321,834	$56,851.02	18
1924..........	6,798,844	2,071,999	444,310.01	22
1925..........	8,473,285	2,146,628	583,067.99	28
1926..........	9,363,474	2,366,745	667,485.50	29
1927..........	10,138,576	2,404,424	719,937.37	31
1928..........	14,205,979	3,421,927	1,065,702.25	32
1929..........	18,890,480	4,260,498	1,481,519.68	35
1930..........	19,418,933	4,473,874	1,509,131.14	34

Passenger Motor Coach Operations, Years 1921 to 1930, Inclusive, of Pacific Electric Railway

Year	Total Passengers	Total Miles	Total Revenue	Revenue per Coach-Mile Cents
1921..........	78,698	75,746	$11,361.76	14
1922..........	84,635	76,009	10,290.40	14
1923..........	2,115.432	708,164	103,390.11	15+
1924..........	9,385,294	3,552,388	487,507.52	13
1925..........	9,931,192	4,181,679	597,041.59	15
1926..........	9,855.898	4,018,964	627,588.38	16
1927..........	9,703,980	4,211,735	690,816.56	16+
1928..........	9,688,211	4,286,441	653,018.07	15+
1929..........	9,723,174	4,345,381	655,567.40	15
1930..........	9,616,059	4,790,235	663,091.87	14

Rail Line Passenger Operations, Years 1921 to 1930, Inclusive, of Pacific Electric Railway

Year	Total Passengers	Total Miles	Total Revenue	Revenue per Coach-Mile, Cents
1921..........	101,617,806	28,920,417	$11,958,762	41+
1922..........	99,896,776	28,905,634	12,885,511	44+
1923..........	112,676,570	31,047,829	14,469,041	46+
1924..........	103,337,029	28,541,612	12,961,419	48
1925..........	94,786,503	26,929,056	11,710,007	47
1926..........	93,547,738	26,588,735	11,387,020	46+
1927..........	92,583,546	26,116,561	11,133,938	46+
1928..........	93,176,241	26,131,126	10,346,948	40
1929..........	94,711,990	25,989,257	10,259,037	40
1930..........	87.598,162	24.870,497	9,293,939	40

Passenger Motor Coach Operations of Motor Transit Company, Year 1930, of Pacific Electric Railway

Year	Total Passengers	Total Miles	Total Revenue	Revenue per Coach-Mile, Cents
1930..........	3,593,750	5,075,171	$1,135,450.44	22+

London Co-ordination Plans Making Progress

When the joint committee of the Houses of Lords and Commons resumed consideration on June 9 after the Whitsuntide recess of the London passenger transport bill announcement was made of a settlement in the case of the London County Council Tramways. The promoters originally proposed that the transfer of these and other municipal tramways within the London traffic area should be by the board assuming the outstanding capital liabilities of the undertakings. On the resumption of the sittings of the joint committee, it was announced that a more definite arrangement had been reached between the promoters and representatives of the London County Council.

Wilfrid Greene, K.C., counsel for the promoters, said that, subject to confirmation by the County Council and, of course, to the approval of Parliament, an arrangement had been reached to the following effect:

A special class of stock will be issued to the amount of the net outstanding debt on March 31, 1932, which, in the case of the London County Council, has been agreed at a round figure of £8,500,000. The stock will bear interest at the rate of 4½ per cent and will rank immediately after the "T.F.A." stock and in front of the "B" stock of the boards. The stock will be a trustee security, to be redeemed at par at the end of 90 years or at any time after 1975 at the option of the board. The Council will undertake not to put stock upon the market for a period of ten years. In regard to other local authorities which operated tramways in the London traffic area, the promoters were willing to agree to an issue of the special stock to the amount of their net outstanding debts.

London County Council Position

Evan Charteris, K.C., counsel for the London County Council, said that in their position against the bill, the London County Council stated that after consultation with their expert advisers, they were satisfied that a settlement on the basis of a transfer of the undertaking, as and from April 1, 1932, in exchange for £8,500,000 would embody principles they had in mind. In deciding to recommend to the Council subject to Parliament, acceptance of these terms, they had been influenced by the knowledge that by such an arrangement the council would retain control of its sinking fund arrangements. It would be understood that the settlement was subject on both sides to agreement being reached on consequential and safeguarding matters. With regard to the method of appointment and the powers of the board, the council remained of the opinion that proposals in the bill under that head were contrary to sound local government principles.

The Government Policy

On the following day, June 10, Herbert Morrison, Minister of Transport, explained his department's policy on the bill. He said that the bill provided for the unification of London passenger transport—a thing desirable in the interests of providing for London an efficient passenger transport service. Consolidation of the ownership of the undertakings was necessary to assure that degree of efficiency which was essential to the success of London passenger transport. As to unification in the hands of a private concern, he believed that to be politically impracticable. He was anxious to lift London passenger transport out of the danger of political controversy.

The Municipal Idea

In regard to a suggestion of municipal ownership, Mr. Morrison said that municipal management, at its best, would be management by one municipal corporation. The only conceivable one they could have would be the London County Council, of which he was a member. But the L.C.C. only covers 117 square miles, whereas the London traffic area is approximately 1,800 square miles. If the undertakings in the traffic area were transferred to the L.C.C., nobody knew better than the L.C.C. what a furious row there would be with the other authorities if the L.C.C. ran their traffic for them. So that was ruled out. He was not enthusiastic over a joint municipal authority. This thing had to be run as a business undertaking, capable of effective and swift action. Therefore, he came back to the business board, to be appointed by the Minister, on the basis of business ability and business management. The scheme must stand or fall on the test of business efficiency and public service. He wanted the board to be a corporate entity. The preponderance of the evidence was all on the side of a small, corporate business body. He deliberately framed the bill to prevent himself, or any other minister, from interfering with the day-to-day management of the board.

The Independent Buses

On a subsequent day, Mr. Morrison was cross-examined on behalf of the independent bus owners, a comparatively small body. He said an effect of the bill would be to abolish competition, but he could not agree that independent companies should be compensated on the basis of profits made in unfair competition with the legitimate carriers. In reply to a point raised that it was proposed to compensate the London General Omnibus Company on the basis of its present position, Mr. Morrison said that company had devoted part of the proceeds of its business to the maintenance of the "tube" railways—essential to London passenger transport. Were it not for that assistance, there would be a risk of the tube railways withdrawing service.

The Position of the Transport Board

Mr. Morrison said that members of the proposed transport board would be free from financial interest in competitive transport undertakings. The board would act as trustee to the public with complete managerial freedom, but with the responsibility for initiative. The board would not be subject to the control of the Minister of Transport. As to fares, the board could not disturb the present general level without either going to the Railway Rates Tribunal or subjecting itself to opposition from the local authorities. As to buses, there would be officers of the board who would devote the whole of their time to the running of the buses as cheaply as they could.

London County Council Agrees

At a meeting on June 16 the London County Council agreed to the terms of settlement for its tramway undertaking, as outlined above in the proceedings before the Joint Parliamentary Committee.

At a later date, Sir William McLintock, the accountant who is the Government's financial adviser on the scheme, handed in to the joint committee on the bill a statement showing the application of the revenue of the London Passenger Transport Board in accordance with the terms of the bill, in which the capital stocks to be issued by the board at its inception are estimated as follows: 4½ per cent "A" stock, £24,280,589; 5 per cent "A" stock, £12,403,950; 4½ per cent "T.F.A." stock, £12,583,000; 5 per cent "B" stock, £23,557,818; "C" stock, £26,753,423.

Sir William's statement shows that the estimated net revenue of the board is sufficient from the outset of the board's activities to provide for the interest on the amounts of "A," "T.F.A." and "B" stocks referred to therein, interest at the rate of 5 per cent per annum on the amount of "C" stock referred to therein, and a sum of £399,622 for reserve. When 6 per cent is paid on such "C" stock, the sum available for reserve would be £132,928.

It is anticipated that consequent upon the natural expansion of traffic and upon the economies to be expected from unification, the net revenue of the board will be sufficient to provide for the sinking funds, which will become effective from 1942 onwards, and also to provide for further reserves and other purposes of the board.

Agreement With "Independents"

At a sitting of the joint committee on June 23, another agreement—namely, one with a number of bus companies operating on the boundaries of the London traffic area—was announced. Mr. Greene, counsel for the promoters of the bill, stated that by agreement the Transport Board's powers to extend services beyond their monopoly area would be subject to the same condition which applied to everybody else—namely, that they could obtain road service licenses. It was proposed now to limit the board's powers to operate to a definite line outside its operating area of 10 miles.

In the arrangement three areas were contemplated. Within the smallest of these the Transport Board would have a monopoly. Outside that area the board would have the right to run services subject to obtaining road service licenses in competition with everybody else. For 10 miles outside the new line, the board would have power to enter into working agreements. The main-line railways agreed with the proposal. The Transport Board would take over from the agreeing bus companies the services which the latter were at present running within the proposed operating area. Regarding overheads, which would remain as a result of the division of the services, the principle accepted was that the nature of these overheads was to be ascertained by arbitration, failing agreement.

Sir Leslie Scott, K.C., on June 24, addressed the committee on behalf of the Metropolitan Railway in opposition to the bill, saying the company was profoundly sceptical about unified ownership. It would prefer to be included in the pooling policy of main-line railways.

At a sitting of the committee on June 30 it was announced that a settlement had been reached between the promoters of the bill and Hertfordshire County Council, which owns tramways operated by the Metropolitan Tramway along with the Middlesex County Council Tramways.

PERSONAL MENTION

C. B. Short Portland Railway Manager—Other Changes

Coincident with the arrival at Portland, Ore., on July 1 of Carlton B. Short to take the general managership of the railway department of the Pacific Northwest Public Service Company, other personnel and functional changes in that company and its subsidiary, Portland General Electric Company, were announced by Franklin T. Griffith, president.

At left—Carlton B. Short, new general manager railways, Pacific Northwest Public Service Company, Portland, Ore. At right—William H. Lines, vice-president, Pacific Northwest Public Service Company, Portland, whom Mr. Short relieves as active head of the railway department.

William H. Lines, vice-president of both companies and for several years manager of the railway department, was appointed treasurer of both companies and given broader responsibilities in both. W. S. McCullough, vice-president and treasurer, Central Public Service Corporation, Chicago, the holding company for the Portland company, and Ray E. Brennan, general auditor of the Portland company, were appointed assistant treasurers of the two companies. Cassius R. Peck, of the legal department in Portland, was appointed secretary of both companies, succeeding R. W. Shepherd, resigned. Clarence D. Phillips, also of the legal department, became assistant secretary.

For a number of years, Mr. Short was secretary and assistant to J. W. Hancock, his predecessor as manager of the Roanoke Railway & Electric Company. During the three years he was at the managerial helm there, Mr. Short has been called on to confront a number of difficult and delicate problems. That he has handled them to the satisfaction of his superiors is amply attested in his transfer to a larger post in the service of the public utilities group which owns the Roanoke company. The Roanoke *Times* said:

> With respect to the news of Carl Short's impending departure from Roanoke to a post of greater responsibility in the far Northwest, it is in order to express commingled regret and felicitations—regret that Roanoke is to lose him as a citizen and that he is no longer to be numbered among the very satisfactory managing executives of public utilities doing business here; felicitations to Portland on acquiring a transportation executive who "knows his stuff" and will deliver if given half a chance to do so.

Mr. Short entered the service of the Roanoke Company as stenographer to the general manager in 1907. A few years later he was made claim agent. In 1917 he left the service of the company, but returned on Jan. 1, 1924, as assistant to the general manager. Two years later he was made assistant general manager and this position he occupied until the Central Public Service Company acquired the property early in 1928, at which time he was made manager.

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H. C. McNaught Manages New London Division

Harry C. McNaught, appointed recently to succeed Samuel Anderson, resigned, as manager of the New London division of the Connecticut Company with offices at Norwich, Conn., entered street railway work in 1904 immediately after leaving high school. He served first as stenographer in the office of the superintendent of the Norwich Street Railway, which later merged with other local street railways and became a part of the Connecticut Company, known as the New London division, with headquarters at Norwich, Conn. Since then Mr. McNaught has been employed continuously as timekeeper, paymaster, cashier, chief clerk, with that company, and with the Shore Line Electric Railway, which leased the properties from 1913 to 1920. In 1920 the lease was terminated and operation resumed by the Connecticut Company, and on April 1, 1920, he was appointed assistant to the manager of the New London division of the Connecticut Company. From that post he was advanced to succeed Mr. Anderson.

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G. K. Jeffries Resigns Indiana Post

George K. Jeffries, for 22 years general superintendent of the Terre Haute, Indianapolis & Eastern Traction Company, has submitted his resignation. The Terre Haute, Indianapolis & Eastern Traction Company was bought at receiver's sale recently and will be tied in with other operations of the Insull interests in Indiana. Mr. Jeffries started his career as a railroad telegrapher in the employ of the Big Four Railroad at Shelbyville and prior to becoming connected with the Terre Haute, Indianapolis & Eastern Traction Company in 1906 he was engaged as a railroad dispatcher and trainmaster and as superintendent of the Indianapolis & Northwestern Traction Company at Lebanon.

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R. P. Woods Heads Mid-West Electric Rail Association

At the annual convention in Denver of the Mid-West Electric Railway Association, July 16 and 17, Robert P. Woods, receiver for the Kansas City, Clay County & St. Joseph Railway, was elected president. He succeeds C. A. Semrad, vice-president of the St. Joseph Railway, Light, Heat & Power Company.

Mr. Woods has been president of the Missouri interurban since January, 1928. Before that he was vice-president of the company for eight years. Between 1914 and 1918 he was city representative of the Kansas City Railways board of control. In this work he had supervision over many of the improvements made by the company. He continued as consulting engineer to the board as he was in a position to direct the carrying out of the extensive traffic improvements which were then being made under the direction of John A. Beeler.

Mr. Woods has had a long career in railway work. In 1901 he was made chief engineer in charge of construction of the Wabash River Traction Line. One year later he was appointed to a similar position with the Indianapolis-Shelbyville interurban. From 1902 to 1904 he served the Indianapolis & Northwestern Traction Company as chief engineer. Later, he was consultant in charge of design and construction of the Lebanon-Thornton Electric Railway, Lebanon, Ind. When the line was completed he was made vice-president and general manager. This position was followed by his becoming president of the company. From 1911 to 1913 he had charge of the building of the 80-mile line of the Kansas City, Clay County & St. Joseph Railway.

Mr. Woods was born in Buffalo, N. Y., in 1870.

Seven Operating Groups for Essex Division

The Essex division of Public Service Co-ordinated Transport, Newark, N. J., has been divided into seven operating groups instead of four districts. The change will provide improved supervision of the various carhouses and garages and the lines operating out of them.

James M. Symington continues as manager of the division, and Aaron H. Hill has been appointed assistant manager. Mr. Hill had been superintendent of the Southern district of this division.

The following appointments as group superintendents and supervisors were announced:

Bloomfield group—Spencer G. Harvey, superintendent; Harry Brown and James Foley, supervisors. Mr. Harvey had been superintendent of the Orange district; Mr. Brown supervisor in Bloomfield, and Mr. Foley, supervisor at South Orange carhouse.

Orange group—John B. McCallum, superintendent; Jeff Lyons and Harold B. Whitman, supervisors. Mr. McCallum had been superintendent of the Northern district; Mr. Lyons, supervisor in Orange, and Mr. Whitman, passenger agent in charge of chartered bus service.

Irvington group—George Klements, superintendent. Mr. Klements had been assistant manager in Central Division.

Ironbound group—John Anderson, superintendent; Albert Bedwin, supervisor. Mr. Anderson had been supervisor at Lake Street garage and Mr. Bedwin had been supervisor at Second River garage.

Kearny group—Joseph H. Moore, supervisor; Alfred Paulson, supervisor. Mr. Moore had been supervisor at Sixteenth Avenue carhouse, and Mr. Paulson, supervisor at Harrison carhouse.

Broad group—James H. Stone, superintendent; Harry E. More, supervisor. Mr. Stone had been supervisor at Orange and Passaic Valley carhouse and garage; Mr. More, supervisor at Sherman Avenue garage.

Weequahic group—Joseph F. Sturm, superintendent; Edward Cone, supervisor. Mr. Sturm had been supervisor at Miller Street carhouse, and Mr. Cone had been superintendent of Bloomfield district.

Associates Honor I. R. Carson

I. R. Carson has just finished his 25th year of service with the Kansas City Public Service Company, Kansas City, Mo. He is assistant superintendent of transportation. He has never owned a motor car and "still rides the street cars." His associates gave him a watch and chain.

E. C. Morris Named to West Virginia Commission

Appointment of Earle C. Morris, a valuation engineer of North Dakota, as its chief engineer, effective July 1, has been announced by the Public Service Commission of West Virginia.

Mr. Morris will have charge of work on valuation of utilities under regulation by the commission and James Imboden, of Kanawha County, who previously had held the title of chief engineer, will remain in the commission's engineering department and continue his present work upon other technical phases of utility engineering.

Mr. Morris is a graduate of Purdue University. For eleven years he has been head of the engineering, valuation and statistical department of the board of railroad commissioners of North Dakota. Prior to joining the North Dakota board in 1920 he served for three years as assistant engineer of the Public Service Commission of Indiana.

W. B. Potter, Engineer and Inventor, Signally Honored

While in Erie recently, W. B. Potter, consulting engineer for the General Electric transportation department (retired) was presented with a set of three volumes containing more than 200 letters from former associates. The letters are reminiscent of many former associations both within and without the General Electric organization. Among the numerous letters are communications from England, Germany, France and Australia. Each letter is neatly mounted and accompanied by a portrait of the writer. The three volumes are attractively bound in morocco, and the letters include messages from numerous high executives, not only of the General Electric Company but of other organizations.

W. B. Potter

Thus was a fine tribute paid to an eminent engineer—a man who played a most important part in electrical development, particularly in the application of electricity to railroading. Even among those who know Mr. Potter well, the fact will probably come as a surprise that more than 130 patents have been issued to him for various inventions, including the series-parallel controller, the surface contact system, the three-wire system of railway operation, electro-pneumatic contact control system and the otheograph. Other patents relate to electric switching, motors, generators, third rail, electric braking, air brakes and various schemes of motor control. This is a mere list, but it does serve to convey an idea of the range of the man's wide technical accomplishments more forcefully than could any prosaic portrayal of them in detail. Mr. Potter conceived the idea for the series-parallel controller in connection with a study of electric railway equipment, in 1892. This has since been used almost universally in control for electric railway motors.

Among projects which engaged his attention were the Manhattan Elevated Railway, Baltimore & Ohio, and Paris-Orleans electrifications, New York Central terminal electrification, and the use of electricity for propulsion on the West Jersey & Sea Shore Railroad, Detroit Tunnel, Great Northern and Southern Pacific lines. During one of his foreign trips he studied the London Underground then being converted to electric operation. Later, the Butte, Anaconda & Pacific, Chicago, Milwaukee & St. Paul and Victorian Railways work was carried out under his supervision.

W. B. Potter is a native of Connecticut. Up to the age of fourteen he lived on a farm, but during his vacations and following graduation from high school he satisfied a craving for electrical machines by working in the shops of the Seth-Thomas Clock Company. Upon leaving school he began service as a machinist apprentice with Sawtele & Judd, Hartford, Conn. After four years' apprenticeship, he was designated to look after all repairs and engines of the Hartford Electric Company. Foreseeing the future of the electrical industry, he secured employment with the Thomson-Houston Company at Lynn and, as a result of studying reports of Frank J. Srague's work with the trolley, decided to follow electric railroading. His first task in this field was in installing equipment for the West End Street Railway, Boston. Experience gained in Boston, Albany, Utica, Saratoga and San Antonio, resulted in Mr. Potter being taken into the engineering department under J. B. Calhoun, in 1890. In 1895, when Walter H. Knight, then engineer of the department, left, Mr. Potter was made chief engineer.

A man of strong opinions, unusually well-informed along lines other than those of his own endeavors, Mr. Potter's numerous inventions show that the new and the untried have a strong appeal for him, and he has always been quick to lend sympathetic aid to others engaged in working out their problems, aid that was in many cases most helpful since the range of the man's own knowledge and his enthusiasm seemed unbounded. Moreover, he has the faculty of communicating his enthusiasm to others. This is a most important attribute, particularly in a man charged with responsibilities such as his have been—a man who contributed liberally of his time to the affairs of technical associations, particularly the American Institute of Electrical Engineers and the American Electric Railway Association.

There is nothing of the scientific recluse about Mr. Potter. Neither has there ever been any sign of showmanship. If his enthusiasm has sometimes led to his holding to ideas with insistence that others thought was too tenacious, then in the light of experiences that proclivity has in most cases proved to be a virtue rather than a vice. Men of an inventive turn of mind need to be tenacious—otherwise they are frequently lost. If that were not true Mr. Potter would not have achieved what he did, and the hundreds of letters of reminiscences, reflecting kindly feeling for him and proclaiming his work, would not have been written. The form of the presentation was unusual, but the tribute is well deserved.

Duties of Lake Erie Railway Officials Being Rearranged

Changes in the operating personnel of the Cincinnati & Lake Erie Railroad, and its subsidiaries, the Lima City Street Railway and the Hamilton city lines, have been announced by Dr. Thomas Conway, Jr., president.

The scope of duties of Truman Curtiss, at present general superintendent of interurban railway operations of the Cincinnati & Lake Erie, has been expanded to include all interurban divisions, as well as the Lima and Hamilton city lines.

Claude Porter, former division superintendent of the Cincinnati and Columbus divisions of C. & L. E., has been made assistant general superintendent and his duties under Mr. Curtiss will include all divisions, as well as the city operation of Lima, Hamilton and Dayton.

James S. Duncan will supervise operation on the Cincinnati and Columbus divisions of C. & L. E., as well as the Hamilton city lines, under the title of superintendent. Mr. Duncan succeeds, at Hamilton, A. C. Starkey, who has been manager of the local line there since 1927.

Thomas E. Haldeman, of Springfield, has been appointed superintendent of the Toledo division of C. & L. E., and manager of the Lima City Street Railway, to succeed Harry G. Mason, resigned. Last year, Mr. Haldeman rounded out a service of 25 years as motorman on the Columbus division of C. & L. E. He has an exceptionally fine record for safe operation, good conduct, and courtesy.

Joseph Bowman, superintendent of the Lima city lines, has entered train service on the Toledo division. His duties will be assumed by Mr. Haldeman.

F. A. Healy, assistant secretary of C. & L. E., has resigned. Mr. Healy has a background of many years in executive capacities with both steam and electric railways. He is well-known in the industry and has made a host of friends during his many years of service.

C. W. Randolph has resigned as superintendent of the C. & L. E. Bus Company. Mr. Randolph's career with the interurban system dates back 25 years.

E. R. Butler, assistant to the general superintendent, was temporarily relieved from present duties and assigned to the passenger traffic department, where he will devote the major part of his time to the solicitation of party and group riding, conventions, special events, etc.

John Fishvogt, assistant to the passenger traffic manager, has been made ticket agent at Cincinnati.

The rest of the executive personnel remains the same: W. L. Butler, executive vice-president; J. Harvey McClure, vice-president in charge of public relations; H. C. Donecker, vice-president in charge of operation; Richard Breckinridge, vice-president in charge of traffic; and J. M. Pogue, vice-president in charge of purchases and bus operation.

George J. Kuhrts, president of the Los Angeles Railway, has been appointed by John C. Porter, Mayor of Los Angeles, as a member of a special committee of nine citizens to conduct a thorough investigation of operations of the Los Angeles Department of Water & Power in order to put at rest rumors concerning the department, and particularly concerning the power bureau. The appointment of the committee has been ratified by the City Council.

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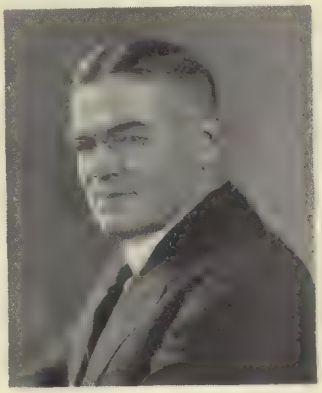
A. G. Ellaway, an alderman at Birmingham, has been elected president for the ensuing year of the British Municipal Tramways & Transport Association. Mr. Ellaway is the sole surviving member of the original Birmingham Tramways Committee founded about 25 years ago.

J. S. Tritle in Important Westinghouse Post

J. S. Tritle, elected vice-president and general manager in charge of manufacturing, sales and engineering operations of the Westinghouse Electric & Manufacturing Company, has long been connected with that company and is unusually well-informed, not only on the phases of its business which come within his immediate purview, but with the history of the company and its fiscal and other policies.



J. S. Tritle

Mr. Tritle was born in Virginia City, Nev., in 1872. He received his early schooling in New Haven, Conn. From preparatory school he entered Yale University, from which he was graduated in 1893 with a degree in science. In 1895 he entered the electrical engineering contracting business in which he continued for eight years. At the outset of the World's Fair in St. Louis he accepted the position as chief of construction. At the close of the fair, he became manager of the Kansas City district for the Westinghouse company. In 1915 the St. Louis and Kansas City offices were consolidated, Mr. Tritle assuming charge of both.

In 1922 the scope of his activities with the company was again widened. He was made manager of the merchandising division of the general sales department of the company. In 1925 when a separate department was made of the merchandising business, Mr. Tritle was made general manager of the merchandising department, overseeing engineering and manufacturing, as well as sales work, with headquarters in Mansfield, Ohio, where most of the merchandising products are made.

From Mansfield Mr. Tritle was moved to East Pittsburgh on May 1, 1929, as vice-president in charge of manufacturing operations. In his new position as vice-president and general manager, Mr. Tritle will retain his headquarters in the Westinghouse company's main works at East Pittsburgh, Pa. He reports to the president, F. A. Merrick.

G. W. Woodruff on Pennsylvania Commission

George W. Woodruff, attorney general under the former administration of Governor Pinchot of Pennsylvania, and more recently legal adviser to the Governor in public utility matters, has been appointed to the Public Service Commission by Governor Pinchot, succeeding Charles H. Young, whose term of office has just expired.

During the heat of the bitter strife that was waged over the Governor's recent attempt to abolish the Public Service Commission and substitute a "Fair Rate Board" of his own choosing, Mr. Woodruff declared, before the House committee investigating the Pinchot charges against the commission and its functioning under the existing statute, that it was his conviction that the Pesnsylvania Public Utility Act was the best in the country.

W. H. Horn Made Manager at Roanoke

W. H. Horn, superintendent of transportation of the Roanoke Railway & Electric Company, Roanoke, Va., has been appointed to succeed C. B. Short as general manager of the company. Like Mr. Short, Mr. Horn is a product of the Hancock school of efficiency and his long connection with the company entitles him to the well merited promotion that has come his way. The Roanoke *Times* said:

> "Bill" Horn is one of us, knows our people and their temperament, knows how to get along with them. He will do well to study the frank and direct methods of his predecessor in the field of public relations, so essential to the successful conduct of a public utility in these modern times. The railway is an admirable example of a public utility that "gets on" with the community in which it is located. That fact is a tribute to managerial common sense as well as to managerial skill.

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Gordon Starr has been made traffic agent of the Winnipeg, Selkirk & Lake Winnipeg Railway, affiliated with the Winnipeg Electric Company. Mr. Starr was formerly in the purchasing department of the latter company, and has been employed there for eight years.

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E. J. Mehren has resigned from the McGraw-Hill Publishing Company, Inc., to assume the presidency of the Portland Cement Association. His new responsibilities carry with them great opportunities for service. Mr. Mehren was associated with McGraw-Hill for more than twenty years. He played an important part in the development of its properties, and of the institution itself. Among his conspicuous service with the company was his work as editor of *Engineering Record* and of *Engineering News-Record.*

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G. L. Harris has been appointed manager of office systems of the Westinghouse Electric & Manufacturing Company. For the last three years, he has been manager of office systems for the Philadelphia Electric Company. Previously, he was manager of office systems for the Georgia Railway & Power Company, Atlanta, and for several years organized and installed office systems in the Insull properties at Chicago. In his new position, Mr. Harris will report to President Merrick.

OBITUARY

T. P. Gaylord

Truman P. Gaylord, vice-president of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., died suddenly on July 5 in Shelby, Mich., where he was born 60 years ago.

The Chicago World's Fair was starting when Mr. Gaylord engaged with the Fair Company as engineer of the underground construction, in which capacity he continued from 1892 to 1893. At the close of the World's Fair, Mr. Gaylord became assistant professor of electrical engineering at Armour Institute of Technology, Chicago, serving there from 1893 to 1898. He was associated with the Commonwealth Edison Company from 1898 to 1899, when he entered the employ of the Westinghouse Company.

He was appointed district manager of the Westinghouse Company's Chicago office in 1902, and occupied that position until he was made acting vice-president in August, 1914. He was elected vice-president in April, 1929.

Mr. Gaylord attended the Allen Academy of Chicago; the University of Michigan, from which he was graduated with the degree of electrical engineer; and Armour Institute of Technology, from which he secured a degree in 1895.

H. L. Hawley

Harry L. Hawley, who represented the Consolidated Car-Heating Company, Inc., in New York for 23 years, died suddenly on July 3, at Summit, N. J., where he made his home during the summer months. Interment was at Waterford, N. Y., on July 6.

Mr. Hawley was born in Saratoga County, New York, and moved to Flatbush, Brooklyn, about 24 years ago, where he had since resided. He was widely known among steam railroad and electric railway officials and among the manufacturers of equipment used in both of these fields.

He is survived by his widow, Mrs. Minnie E. Hawley, his brother, Cornell S. Hawley, the president of the Consolidated Car-Heating Company, Inc., his nephews, Edward B. Hawley, Waterford, and Harold A. Hawley, Flushing, and his niece, Mrs. Chester B. Parkis, Waterford.

Ira M. Cobe

Ira Maurice Cobe, Chicago investment banker, died on July 9 at his summer home in Northport, Me. He was 64 years old.

In October, 1914, Mr. Cobe resigned all his Chicago connections and withdrew permanently to his home. At that time the Chicago Surface Lines announced the resignation of Mr. Cobe as chairman of the executive committee of the surface lines, as chairman of the executive committee of the Chicago City & Connecting Railways, and as a member of the board of operation of the Chicago Surface Lines. At the same time, Mr. Cobe tendered his resignation as member of the board of directors and executive committee of the Northwestern Elevated Railway and of the governing committee of the Chicago Elevated Railways. He also withdrew from the directorate of the Chicago Title & Trust Company.

A native of Boston, where he was graduated at Boston University, Mr. Cobe was admitted to the Massachusetts bar in 1888 and practiced law in Boston four years. In 1892 he joined in organizing the firm of Cobe & McKinnon, investment brokers, in Chicago, and in rapid succession became president of the Assets Realization Company, chairman of the board of the Chicago Railways, director of the Chicago Title & Trust Company, director of the Calumet & South Chicago Railway, chairman of the Hammond, Whiting & East Chicago Railway, director of the National Bank of the Republic, director of the Financial Corporation of America and chairman of the governing commission of the Chicago City & Connecting Railways.

W. H. Whiteside

Walter Hunter Whiteside, 70, corporation executive, died unexpectedly at his home in Los Angeles, Cal., on July 18. Mr. Whiteside retired in 1926 from the position of Pacific Coast representative of the Westinghouse Electric & Manufacturing Company, with which he had been connected in Pittsburgh and New York for many years. He left Westinghouse in 1904 to become president of the Allis-Chalmers Company, but resigned from Allis-Chalmers in 1911 to take the presidency of the Stevens-Duryea Company, automobile manufacturers. The latter post he held until he returned to Westinghouse in Los Angeles in 1916. Mr. Whiteside was born in Wabash, Ind., and was graduated from Wabash College.

R. L. Crump

Ralph L. Crump, associated with Ford, Bacon & Davis for many years, died in Philadelphia on July 17. Mr. Crump attended Pennsylvania State College, and entered the electric railway field with the Johnson Company, now the Lorain Steel Company, in Atlanta, Ga. He next was employed by William Wharton, Jr., & Company, Inc., as engineer on track construction in Philadelphia. In 1896 he became resident engineer of Ford, Bacon & Davis on the reconstruction of the Canal & Claiborne Railroad in New Orleans, and then served successively as resident engineer on the New Jersey & Hudson River Railroad & Ferry Company, New Orleans & Carrollton Railroad, Kansas City Railway & Light Company, Memphis Street Railway and the American Cities Railway & Light Company. During the World War he was an engineer in the transportation and housing division of the United States Shipping Board. About ten years go Mr. Crump retired from active business.

George Fillmore Swain

George Fillmore Swain, McKay professor emeritus of engineering at Harvard and an authority on hydraulic engineering, died on July 1 at his summer home in Holderness, N. H., at the age of 73 years.

Professor Swain taught civil engineering at M. I. T. and later at Harvard, and was a consulting engineer of national reputation, serving many public service commissions. As a member of the Boston Transit Commission, of which he later became chairman, he had much to do with the construction of the subway and elevated systems. His interests extended beyond engineering; he was a linguist, a student of literature, and a patron of art.

Born in San Francisco, Professor Swain was graduated from the Massachusetts Institute of Technology in 1887 and continued his studies at the Royal Polytechnique School in Berlin. New York University and the University of California honored him with LL.D. degrees.

He was a past president of the American Society of Civil Engineers, the Boston Society of Civil Engineers, and the Society for the Promotion of Engineering Education. In addition he was a member of many technical societies.

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Edward A. Pearson, who developed large real estate holdings in the Oranges in the '80s, built the Orange & Bloomfield Crosstown Railway, now included in the system of the Public Service Coordinated Transport, and was active in banking and insurance, died at Newark, N. J., on June 27. He was 92 years old. Mr. Pearson was a founder of the Hydrogen Company of the United States, which concern pioneered in the production of gun metal.

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Dr. William T. Riley, connected with the United Railways & Electric Company of Baltimore for 28 years, died at his home in Baltimore on July 7. He served as a coroner of Baltimore for 30 years. Dr. Riley was one of the three physicians of the United Railways Association, the welfare organization of the company. He also was surgeon for the Pennsylvania Railroad and Western Maryland Railway, and medical examiner for the Metropolitan and Continental Life Insurance Companies.

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John A. Miller, former District Court judge at Newark, N. J., son of John A. Miller, head of the original Newark & Bloomfield Street Railway, now included in Public Service Co-ordinated Transport and father of John A. Miller, Jr., editor of ELECTRIC RAILWAY JOURNAL, died at Glen Ridge, N. J., on July 12. He was one of the oldest members of the New Jersey Bar and for many years before his retirement, about ten years ago, was prominent in the practice of corporation and real estate law. He was a graduate of Rutgers College and Columbia Law School.

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Dick S. Ramsey, former president of the East River Savings Bank and at one time prominent in civic and business affairs in Brooklyn, died on June 27. He was in his 85th year. He was a former member of the board of directors of the Kings County Trust Company, one of the original Brooklyn Bridge Commissioners and a former member of the board of the Brooklyn City Railroad, now included in the Brooklyn-Manhattan Transit System.

◆

Clement J. Ferneding, 85 years old, vice-president and treasurer of the Dayton & Xenia Railway, Dayton, Ohio, and for many years a leading business man of Dayton, died on June 27.

INDUSTRY MARKET AND TRADE NEWS

New White buses with standard Bender bodies for Birmingham

Birmingham Purchases Buses for Irondale Line

Bus service has been instituted by the Birmingham Electric Company along the Gate City-Irondale line. This line was originally built in 1886 and operated with a steam dummy. It was electrified July 28, 1903. A large portion of it was on private right-of-way, but recently the city of Birmingham passed an ordinance to pave the street, which would entail a cost of $85,000 to the railway. Rather than make this large expenditure, it was decided to abandon the service and place gas buses on the line. A careful survey showed that the traffic did not justify the expenditure necessary to install trolley buses. Three White buses with Bender bodies were purchased and placed in service in June.

Only 23 seats are installed in the body, which is a 29-passenger model. The seats, by Hale & Kilburn, are leather faced and rattan covered. Both front and rear doors, and the rear treadle, are actuated with National Pneumatic Company air engines.

Wide aisles speed passenger movement

◆

New Officers for A.S.T.M.

Election of the following officers for the ensuing year has been announced by the American Society for Testing Materials: President, Frank O. Clements, technical director research laboratories, General Motors Corporation; and vice-president, Samuel T. Wagner, consulting engineer Reading Company. Those elected to the Executive Committee are: Arthur W. Carpenter, Kenneth B. Cook, J. B. Johnson, George C. D. Lenth, and O. L. Moore.

◆

Westinghouse Declares Dividend

Following the meeting of the board of directors of the Westinghouse Electric & Manufacturing Company, the following statement was issued by A. W. Robertson, chairman:

> Although the earnings for April and May of the second quarter were not sufficient to cover the dividend requirements of the company, yet they were so far improved as to show a small profit as compared with a loss of the three preceding months.
>
> It was the opinion of the directors, that, considering the fine cash position of the company and the substantial surplus which has been accumulated over the past years and not distributed to the stockholders, dividends should be declared. Accordingly a dividend of 2 per cent ($1 per share) on the preferred stock was declared for the quarter ending June 30, 1931, payable July 31, 1931, to stock of record July 6, 1931, and a dividend of 2 per cent ($1 per share) on the common stock was declared for the quarter ending June 30, 1931, payable July 31, 1931, to stock of record July 6, 1931.

◆

Montreal Expands Bus Operation

Further expansion in its bus activities is seen in a recent order of Montreal Tramways for twenty new buses. The Associated Equipment Company of Canada will supply fifteen of these, and Leyland Company the remainder. The chassis are manufactured in England and bodies are made by the Canadian Car & Foundry Company, in Montreal.

The company also has on order two diesel direct-drive engines suitable for bus operation. These engines, however, are still in the trial stage in England and it will probably be another year before they will be ready for service.

At the end of last year the company owned 119 motor buses operating over 88 miles of route. Operation of trolley buses for certain lines also has been considered.

Osgood Bradley Gets $500,000 Contract

An order for twenty cars, amounting to $500,000, has been received by the Osgood Bradley Car Corporation from the Ferrocarril Terminal Central de Buenos Aires, Argentina. The cars will be used in the operation of the new subway now under construction. They will be similar to the cars operating in the old subway which were built by the Metropolitan Vickers Electrical Company of England. The cars will be ready for shipment in January, 1932.

With a length of 52 ft. and an over-all width of 10 ft. 3½ in., the cars will have a seated capacity of 44. Three doors on each side of the car will speed loading and unloading of passengers. The electrical equipment will be supplied by the General Electric Company, and all door mechanisms by the National Pneumatic Company. Westinghouse air brake equipment will be used. The cars will weigh 71,000 lb. complete with two 125-hp. motors.

◆

H. T. Thompson With Metal & Thermit

Harry T. Thompson, formerly vice-president of the Differential Steel Car Company, Findlay, Ohio, has become associated with the sales department of the Metal & Thermit Corporation in New York. Mr. Thompson was graduated from the Georgia School of Technology in electrical engineering in the class of 1912. After his graduation he was connected with the Westinghouse Electric & Manufacturing Company until he entered the Army in 1917. He served through the war as a captain in the artillery, leaving the service in 1919. He then became connected with the engineering department of the American Telephone & Telegraph Company, but resigned from that company on Dec. 1, 1920, to join the organization of the Differential Steel Car Company, of which company he became vice-president.

◆

General Electric Shows Sales Decrease for First Six Months

Orders received by the General Electric Company for the first six months of 1931 amounted to $141,428,978, compared with $190,313,758 for the corresponding period last year, Gerard Swope, president, announced. Sales billed for the first six months of 1931 amounted to $141,180,891, compared with $197,229,346 for the corresponding period last year.

Profit available for dividends on common stock for the first six months of 1931 was $21,523,722, compared with $29,273,276 for the first six months last year. The profit available for common stock for the six months is equivalent to 75 cents per share in 1931 and $1.01 per share in 1930 on the 28,845,927 shares outstanding in both periods. The quarterly dividend is 40 cents a share.

The stockholders to whom the July dividend is to be distributed total 133,163, compared with 116,750 at the end of 1930 and with 88,408 a year ago, an increase of 50 per cent over a year ago.

Bus Deliveries

Arkansas Power & Light Company, Pine Bluff, Ark., one White, Model 613.

Boston Elevated Railway, Boston, Mass., ten A.C.F., metropolitan type.

Capital Traction Company, Washington, D. C., two Twin Coach, Model 20.

Capitol District Transportation Company, Albany, N. Y., thirteen Twin Coach, Model 40.

Connecticut Company, New Haven, Conn., eleven Yellow Coach, 38-passenger, Type Z.

Duluth Street Railway, Duluth, Minn., four Twin Coach, Model 20.

Eastern Massachusetts Street Railway, Boston, Mass., eleven A.C.F., metropolitan type; five White, Model 65A; and fifteen Twin Coach, two Model 40 and thirteen Model 30.

Reading Transit Bus Company, Reading, Pa., two Twin Coach, Model 30.

Sault Ste. Marie Traction Company, Sault Ste. Marie, Mich., two Yellow Coach, 21-passenger, Type U.

Scranton Bus Company, Scranton, Pa., four White, Model 54.

Third Avenue Railway, New York, N. Y., ten White, Model 54A.

Virginia Electric & Power Company, Richmond, Va., ten Twin Coach, Model 30.

Williamsport Transportation Company, Williamsport, Pa., six Twin Coach, Model 30.

Worcester Consolidated Street Railway, Worcester, Mass., one Yellow Coach, 25-passenger, Type U.

◆

TRADE NOTES

Westinghouse Electric & Manufacturing Company announces the appointment of M. B. Lambert as sales manager in charge of the transportation department.

U. S. Hame Company of Buffalo has purchased the assets of both the Lawson Manufacturing Company, Cleveland, Ohio, and the Warner Hammer Company of Cromwell, Conn.

DeVilbiss Company has moved its St. Louis sales and service branch to 1937 Washington Avenue, and its New York branch to 25 West 45th Street.

Fusion Welding Corporation, Chicago, Ill., has appointed the Puritan Compressed Gas Corporation of Kansas City, Mo., as distributor for the Weldite line of welding rods.

E. A. McCallum, who was in charge of the San Francisco offices of the Stacey Engineering Company, has been transferred to the Pacific Coast headquarters of the International-Stacey Corporation, now located at 410 Subway Terminal Building, Los Angeles.

Conspectus of Indexes for July, 1931

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years High	Last Five Years Low
Street Railway Fares* 1913 = 4.84	July, 1931 **7.81**	June, 1931 **7.81**	July, 1930 **7.77**	July, 1931 **7.81**	July, 1926 **7.35**
Electric Railway Materials* 1913 = 100	July, 1931 **114**	June, 1931 **116**	July, 1930 **136**	Dec., 1926 **159**	July, 1931 **114**
Electric Railway Wages* 1913 = 100	July, 1931 **232.9**	June, 1931 **233.0**	July, 1930 **231.7**	April, 1931 **233.2**	July, 1926 **225.7**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	July, 1931 **169**	June, 1931 **184**	July, 1930 **198**	Nov., 1928 **206**	July, 1931 **169**
General Construction Cost Eng'g News-Record 1913 = 100	July, 1931 **174.4**	June, 1931 **187.2**	July, 1930 **201.0**	Jan., 1927 **211.5**	July, 1931 **174.4**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	June, 1931 **70.0**	May, 1931 **71.3**	June, 1930 **86.8**	June, 1926 **100.5**	June, 1931 **70.0**
Wholesale Commodities Bradstreet 1913 = 9.21	July, 1931 **8.78**	June, 1931 **8.64**	July, 1930 **10.56**	Jan., 1928 **13.57**	June, 1931 **8.64**
Retail Food U. S. Bur. Lab. Stat. 1913 = 100	June, 1931 **118.3**	May, 1931 **121.0**	June, 1930 **147.9**	Dec., 1926 **161.8**	June, 1931 **118.3**
Cost of Living Nat. Ind. Conf. Bd. 1923 = 100	May, 1931 **86.9**	April, 1931 **88.2**	May, 1930 **97.5**	Dec., 1926 **105.5**	May, 1931 **86.9**
General Business The Business Week Normal = 100	July 11, 1931 **78.1**	June 13, 1931 **77.6**	July 12, 1930 **97.5**	Oct. 6, 1928 **117.6**	Jan. 31, 1931 **77.0**
Industrial Activity Elec. World, kw.-hr. ysed 1923-25 = 100	June, 1931 **104.8**	May, 1931 **109.8**	June, 1930 **115.5**	Feb., 1929 **140.4**	Jan., 1931 **97.6**
Bank Clearings Outside N. Y. City 1926 = 100	June, 1931 **71.2**	May, 1931 **68.6**	June, 1930 **92.1**	Oct., 1929 **111.8**	May, 1931 **68.6**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Material Prices

JULY 23, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	8.00
Lead	4.40
Nickel, ingot	35.00
Zinc	4.25
Tin, Straits	25.00
Aluminum, 98 to 99 per cent	22.90
Babbitt metal, warehouse	
Commercial grade	34.00
General service	28.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{9}{16}$-in. and larger, per 100 lb.	$2.70
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, 6m.x 8m.x8 ft.,	
White Oak, Chicago	1.21
Long leaf pine, New York	1.00

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	7.00–11.00
Colored	7.00–10.00

Wire—New York

Bare copper wire, cents per lb.	9.75
Rubber-covered wire, No. 14, per 1,000 ft.	$4.22
Weatherproof wire base, cents per lb.	12.125

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	9.60
White lead in oil (100lb. keg), cents per lb.	13.25
Red lead in oil	14.75
Turpentine (bbl. lots), cents per gal.	42.00
Putty, com'l grade, 100 lb. tins, cents per lb.	5.50

Hardware—Pittsburgh

Wire nails, per keg	$1.85
Sheet iron (24 gage), cents per lb.	2.40
Sheet iron, galvanized (24 gage), cents per lb.	2.90
Auto body sheets (20 gage), cents per lb.	3.10
Fender stock (20 gage), cents per lb.	3.20

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	.80
Kansas screenings, Kansas City	1.40
Big seam, Ala., mine run	1.70
Smokeless mine run, Chicago	1.60

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$120.00
Wood block paving 3½, 16 lb. treatment, N.Y., per sq.yd., f.o.b.	2.50
Paving brick, 3½x8½x4, N.Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., whosesale, f.o.b. per cu.yd	1.75
Cement, Chicago, in carload lots, without bags, f.o.b.	1.35
Gravel, ¾-in., cu.yd., wholesale, f.o.b.	1.60
Sand, cu.yd., wholesale, f.o.b.	1.00
Asphalt, in pkg. N.Y., f.o.b. ref., per ton	16.00

Scrap—New York

Heavy copper, cents per lb.	6.12
Light copper	5.12
Heavy brass	3.12
Zinc	1.50
Lead, heavy	3.00
Mixed babbitt	3.25
Battery lead plates	1.13
Cast aluminum	9.75
Sheet aluminum	10.25
Auto radiators	3.12
Tires, standard, mixed, per ton	$5.25
Inner tubes, mixed, per cwt.	$1.20

Old Material—Chicago

Steel car axels, net ton	$11.75
Cast iron car wheels, gross ton	10.25
Steel car wheels, gross ton	10.00
Leaf springs, cut apart, gross ton	11.25
Angle bars, gross ton	9.50
Brake shoes, net ton	6.00
Steel rails (short), gross ton	11.25
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	3.75
Coil springs, per gross ton	11.75
Frogs, switches and guards cut apart, yer gross ton	8.75

Once to Every Car!

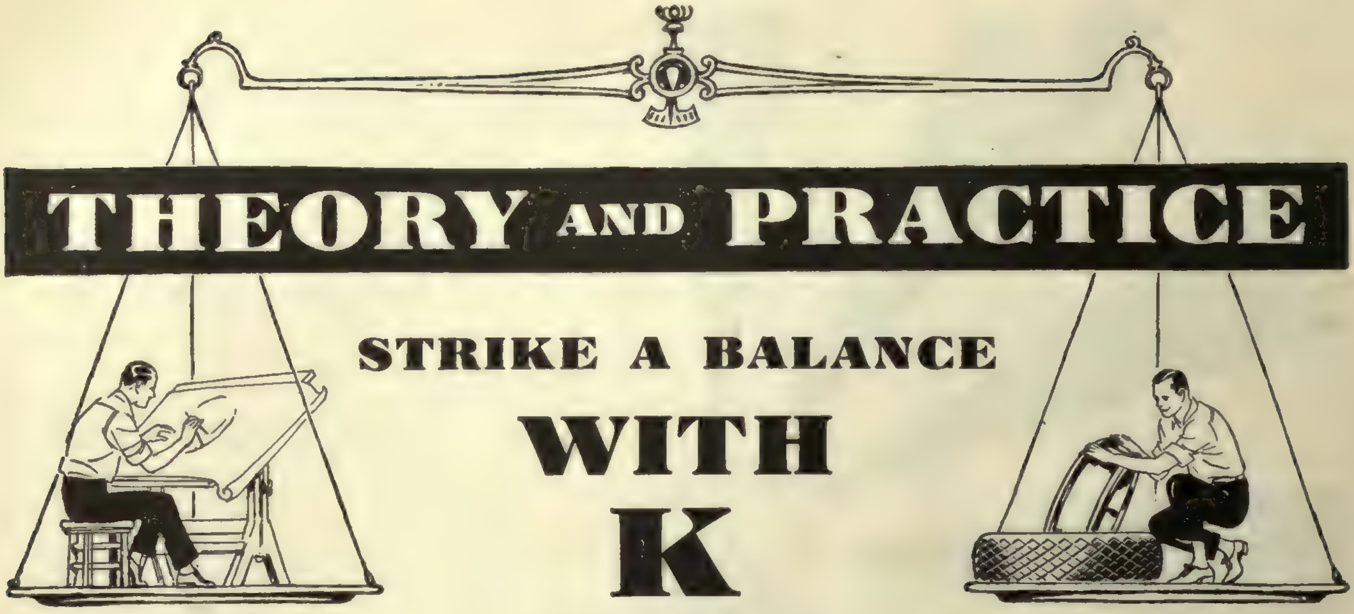
THE BIG EMERGENCY,
ANTICIPATE IT WITH

Peacock Staffless Brakes

That one emergency may cost you plenty. Can you afford to be without braking equipment which functions positively in the emergency?

National Brake Company

890 Ellicott Square, Buffalo, N. Y.
Canada:—Lyman Tube & Supply Co., Ltd., Montreal
The Ellcon Co., General Sales Representative, 50 Church Street, New York City



THEORY AND PRACTICE

STRIKE A BALANCE

WITH

K

RIMS

The Theory of An Ideal Truck Rim	***The Practical Application of Theory in K-Rim***
1 *Simple Design*	Two parts—All sizes
2 *Light Weight*	Minimum weight obtained by proper distribution of steel which in turn produces
3 *Ample Strength*	Maximum strength at points of greatest strain
4 *Ease of Operation*	Open valve stem slot and split base permit easy removal of rim from the tire and prevents injury to casing, tube and valve stem
5 *Safety in Service*	Split base is locked between wheel and continuous side ring—mechanical locked assembly
6 *Interchangeable Mounting*	All sizes single bevel 28° or 18° mounting seat permits oversizing and maintains standard spacings

In combination—these fundamental features of the Goodyear K-Rim are not equaled by any other truck rim

GOODYEAR

K-28 RIMS K-18

THE MAN WHO CHANGES THE TIRES LIKES GOODYEAR "K" RIMS

12 YEARS IN THE TWIN CITIES

For 12 years Goodyear Tires have been on the wheels of passenger coaches operated in Minneapolis and St. Paul by the Twin City Motor Bus Co.

For 7 years, no tires except Goodyears have been used.

It is a record of service so satisfactory that it has grown through the years—tire mileages highly satisfactory—road delays seldom known.

Such performance as this is the reason for Goodyear's outstanding position today in the tire industry—such experiences as this explain why more people ride on Goodyear Tires than on any other kind.

Why shouldn't you use THE leading make of tire?

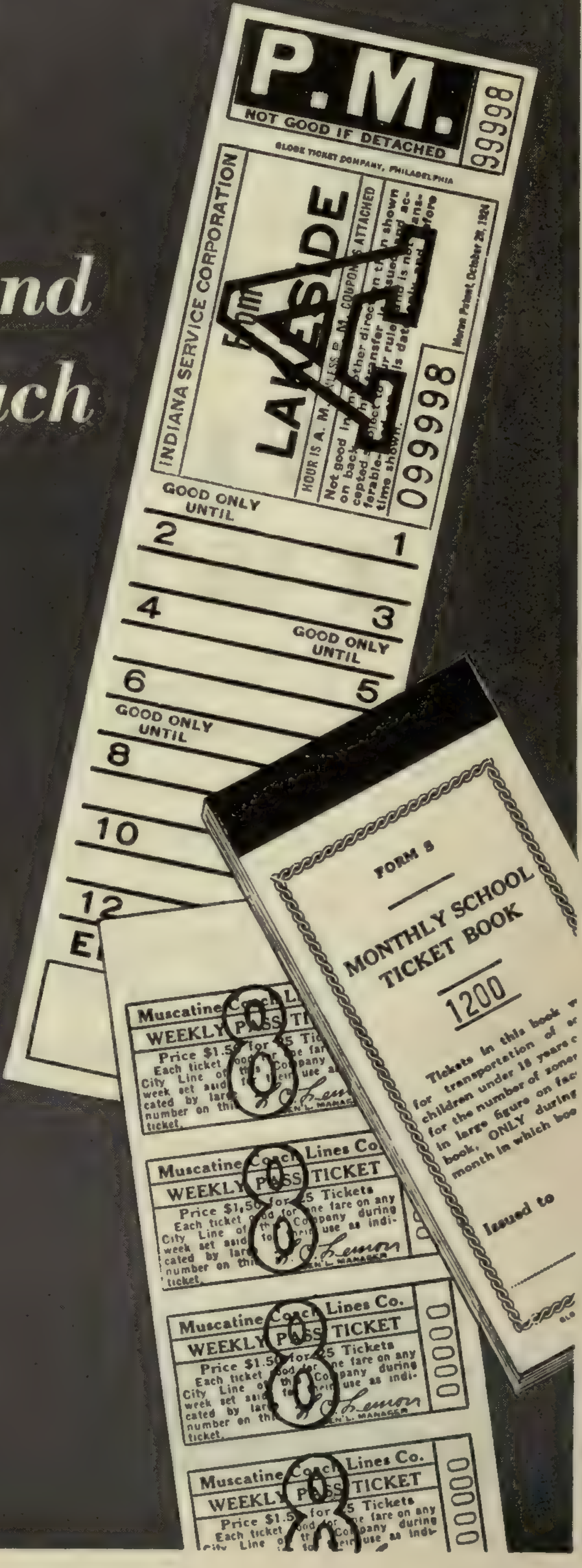
THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS

NO DOUBT ABOUT IT . . .

Correct transfers cut minutes from schedules . . . add dollars to net . . . and "double-check" each fare


P.M.
NOT GOOD IF DETACHED
99998
GLOBE TICKET COMPANY, PHILADELPHIA
INDIANA SERVICE CORPORATION
LAKESIDE
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GOOD ONLY UNTIL
FORM 8
MONTHLY SCHOOL TICKET BOOK
1200
Issued to
Muscatine Coach Lines Co.
WEEKLY PASS TICKET
Price $1.50 for 5 Tickets

It is but natural that a transfer series, designed for the exclusive use of a railway or bus property, should greatly reduce revenue leaks, avoid fraud, and speed up traffic.

The proof is on file. Many operating companies are saving thousands of dollars yearly with Globe-designed ticket-transfer systems.

Don't try to do the whole job alone. *Let our experienced men help you.*

Globe
TICKET COMPANY
112 North Twelfth Street
PHILADELPHIA

Additional Factories in
Los Angeles Boston New York Jacksonville
Sales Offices
Baltimore Cincinnati Cleveland Pittsburgh
Syracuse

REPUTATION
EXPERIENCE
SATISFACTION

-dictate

TIMKEN AXLES

FRONT *and* WORM DRIVE REAR
for *all* traction equipment

THE TIMKEN-DETROIT AXLE CO. DETROIT, MICHIGAN

Your best friends won't tell you . . .

The
METAL & THERMIT

120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So. San Francisco Toronto

Does rough track add to the discomforts of riding?

Do pounding car wheels keep your neighbors awake?

Has the street railway any friends at indignation meetings?

but your neighbors and patrons will!

ARE you proud of the street railway system with which you are associated?

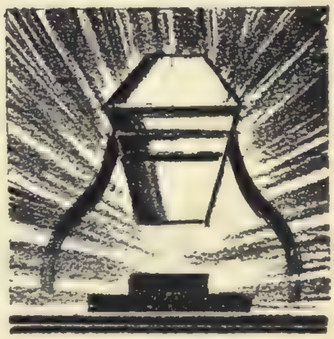
Whether employee or stockholder, president or foreman, transportation man or track-man, we all crave praise. We all dislike harsh criticism.

It is not your partner on the golf course, nor the guest at the dinner table who bluntly tells you the defects of your railway service. It is the fellow in the next block whose slumber is broken by the pounding of car wheels over bad joints. It is the chap who rides to work in the early morning rush hour and is tossed around on rough-riding track. It is the fellow who writes his letter of protest to the newspaper, or rises to speak at local indignation meetings. No management need permit bad track to be a source of criticism. Smooth and quiet-riding track need cost no more when joints are Thermit-welded. And it remains "good" throughout the entire life of the rails themselves.

Materials and labor now are at record "lows." A good time, an opportune time, for Thermit-welding.

THERMIT RAIL WELDING HAS SOLVED THIS PROBLEM

Many a road has miles of track, in which the joints are "shot," but the rail and roadbed still has useful life. Thermit-welding has solved this problem for many managements. Old track has been fixed up, and has lasted for ten to fifteen years in good, smooth-operating condition until the rail-head itself has worn down to the limit.



CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto

1881
/
1931

CELEBRATING 50 YEARS OF PROGRESS IN THE ELECTRIC RAILWAY INDUSTRY

GOLDEN JUBILEE CONVENTION

THE BIG SHOW is little more than a month away. The 50th meeting—Golden Jubilee—of the A. E. R. A. An event that comes but once in an industry's lifetime.

Important industry executives will be at Atlantic City during the week of September 26 - October 2. Important features will distinguish this year's Exhibit—in the great Atlantic City Auditorium—displays recalling the industry's fifty years of progress, as well as the latest modern equipment. And this year, for the first time, the National Association of Motor Bus Operators will hold their annual meeting during the same week, at the same place.

The CONVENTION NUMBER of *Electric Railway Journal* will be mailed to subscribers September 15. It will also be distributed at Atlantic City. It will be much more than an ordinary convention issue. The history of the Journal is the history of the industry, and this issue will reflect that fact. It will be an invaluable historical document that every one interested in community transport will want to read and keep.

Advertising forms close September 11!

ELECTRIC RAILWAY JOURNAL
McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th St., New York

CONVENTION NUMBER
Electric Railway Journal
Sept. 15

GOLDEN JUBILEE CONVENTION
A. E. R. A.
Sept. 26 - Oct. 2

CONVENTION REPORT NUMBER
Electric Railway Journal
Oct. 2

NUMBER of Electric Railway Journal

Forms Close Sept. 11

Some of the 115 Socony fueled and lubricated buses of the North Shore Bus Company at their Flushing, L. I., terminal, one of the largest bus terminals of its kind in the country. Here 850 passengers can be loaded within ten minutes' time. Seventeen buses can be loaded at once.

325,000 Miles

a month with SOCONY!

AVERAGING 325,000 miles a month, the 115 passenger buses of the North Shore Bus Company, Inc., operating in Manhattan, Queens, and Nassau County, L. I., are fueled and lubricated exclusively with Socony. Efficient, economical operation is why this big company has used only Socony products for the past four years.

Whether your buses operate many miles or few, you will find that Socony gives you better performance and lower repair bills.

SOCONY

BANNER GASOLINE **SOCONY DE-WAXED MOTOR OIL**

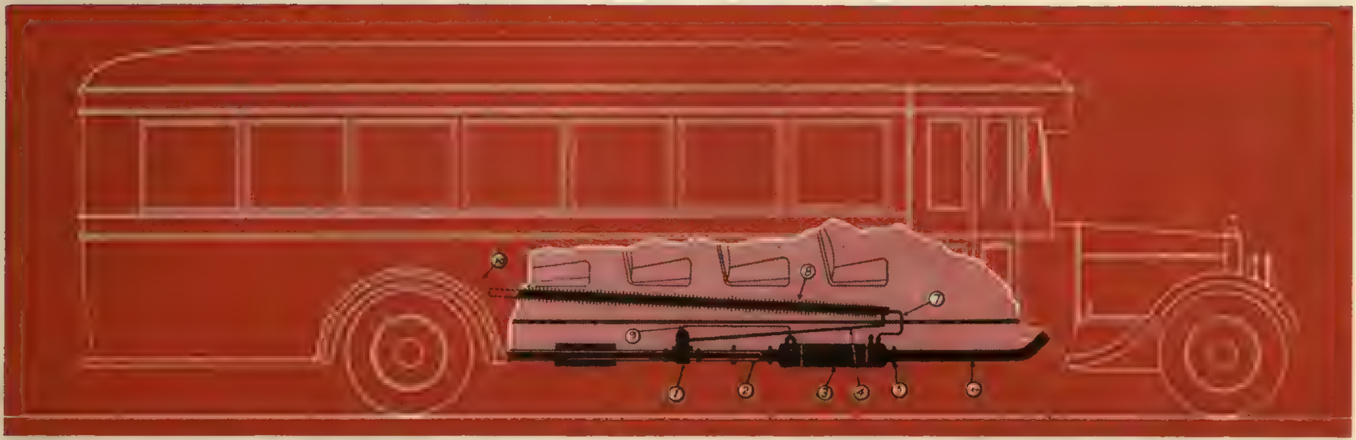
SPECIAL GASOLINE *plus* ETHYL

STANDARD OIL COMPANY OF NEW YORK

AN EXTRAORDINARY ANNOUNCEMENT

Only 3 CUPS OF WATER TO HEAT AN ENTIRE BUS

. . . *without costing a* PENNY !



Safe, Cheap, *Quickly Controlled* Heat, *with the New* BORDEAUX *Steam Generator System*

THREE years of intensive research produced this startling advance in bus heating methods! Safe, comfortable, uniform heat . . . yet without a penny's cost.

The new Bordeaux System derives its heat and power from the exhaust gases, and is a super-heated steam system circulating only about three cups of water. Simple in construction as well as in operation. It is sealed throughout, has only two moving parts, and is built of rust-, wear-, and corrosion-resisting materials. The driver regulates the temperature from the dash.

Unlike many heat units, the Bordeaux System is not bulky nor in the way. Installation is permanent: thereafter it is always on the job, ready for those uncomfortable out-of-season cold snaps.

---

10 IMPORTANT FEATURES *in this* Radical New Design

(See Numerals Above)

① ***Pump Unit*** . . . from which a regulated flow of water is pumped to the Steam Generator. The Pump is substantially built with only one moving part: a sealed hydrostatic valve.

② ***Control Unit*** . . . consists of a butterfly valve, operated from the dash to regulate the amount of exhaust gas by-passed through the base of the Pump. This determines the rate at which the Pump operates.

③ ***Generator*** . . . spiral alloy around the exhaust conduit. These generate and super-heat the steam.

④ ***Water Return Pipe*** . . . collects the condensation in the radiator and returns it to the Pump.

⑤ ***Flanged Joint*** . . . here the 3" diam. mandrel covered with the generator coils is set into the exhaust pipe. It interferes in no way with the exhaust.

⑥ ***Steam Pipe Supply*** . . . insulated copper tubing conveys super-heated steam to radiator.

⑦ ***Radiator*** . . . only one shown here—but each bus carries two. Consists of seamless copper pipe with steel fins. Runs laterally under each row of seats.

⑧ ***Water Feed Pipe*** . . . carries water from Pump to the Generator.

⑨ ***Compressor Tank*** . . . one at end of each Radiator to take up any air trapped in the system and permit Radiator to heat throughout its entire length, without tapping condensate liquid.

⑩ ***Pump Exhaust*** . . . carries by-passed exhaust gases to rear of bus and dispels them noiselessly.

The Bordeaux System is easy to install and economical to maintain. Every Bordeaux System is guaranteed and entitled to the constant and free supervision of the Bordeaux Laboratory staff of heating experts. For full particulars, write to the Bordeaux Laboratories, Inc., Albany, New York.

SOON . . . *See the* Bordeaux Demonstrator *in Your Locality*

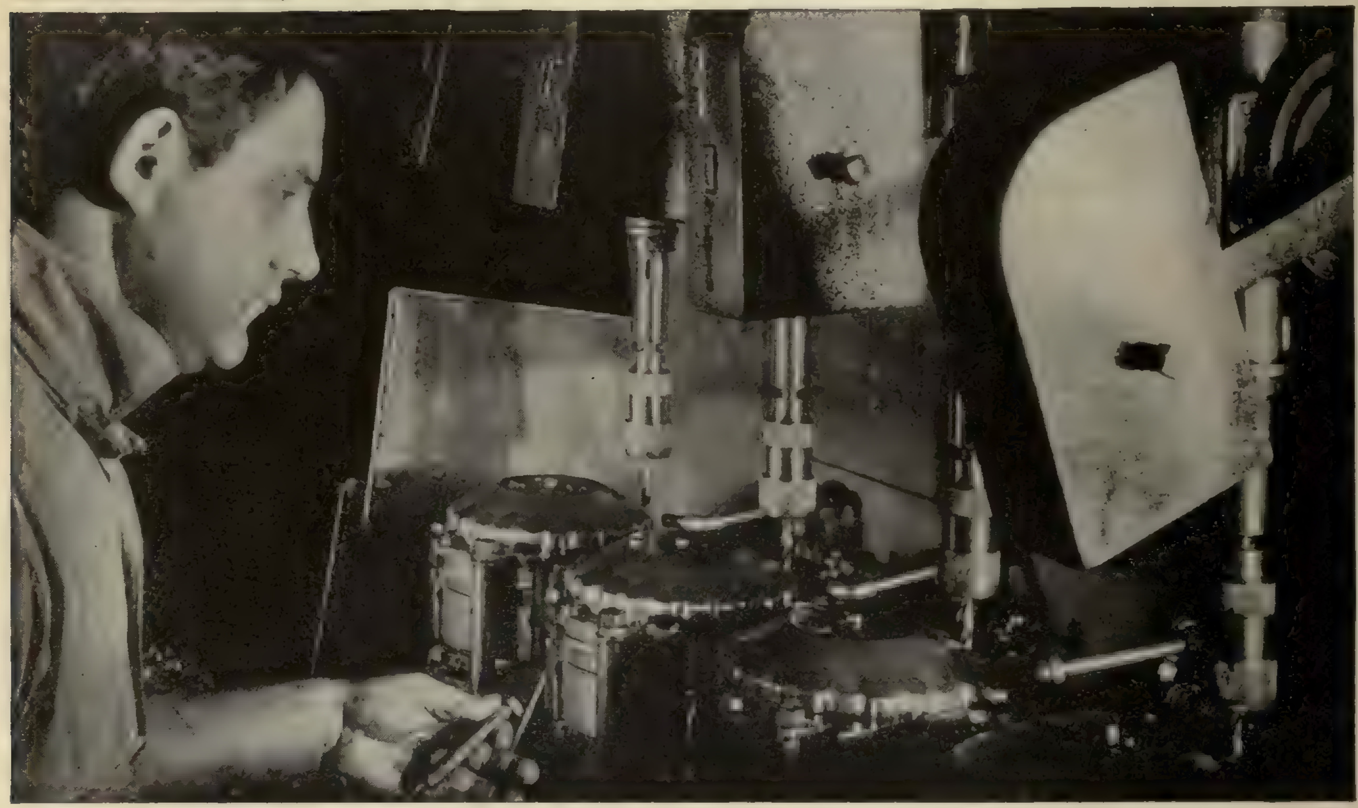
A 16 passenger motor coach, recently purchased by the Bordeaux Laboratories, is being equipped with a Bordeaux Steam Generator System, a recording pyrometer and other test instruments. Dry ice is to be used in the obtaining of low temperatures for demonstration purposes. This Bordeaux Bus is soon to tour Eastern and Middle Western states under the direction of Mr. Wallin, President of Bordeaux Laboratories. A service engineer will demonstrate to all interested transportation officials.

BORDEAUX
STEAM GENERATOR
SYSTEM

AN AUTOMOTIVE TRUST FULFILLED

Leading motor car builders depend on R B & W for entire supply of an important bolt

PHOTO BY MARGARET BOURKE-WHITE



It's an important bolt in motor car assembly. A highly specialized bolt. We make millions of them every year for one of the very largest builders of popular-priced cars. We make this builder's entire supply of these important bolts.

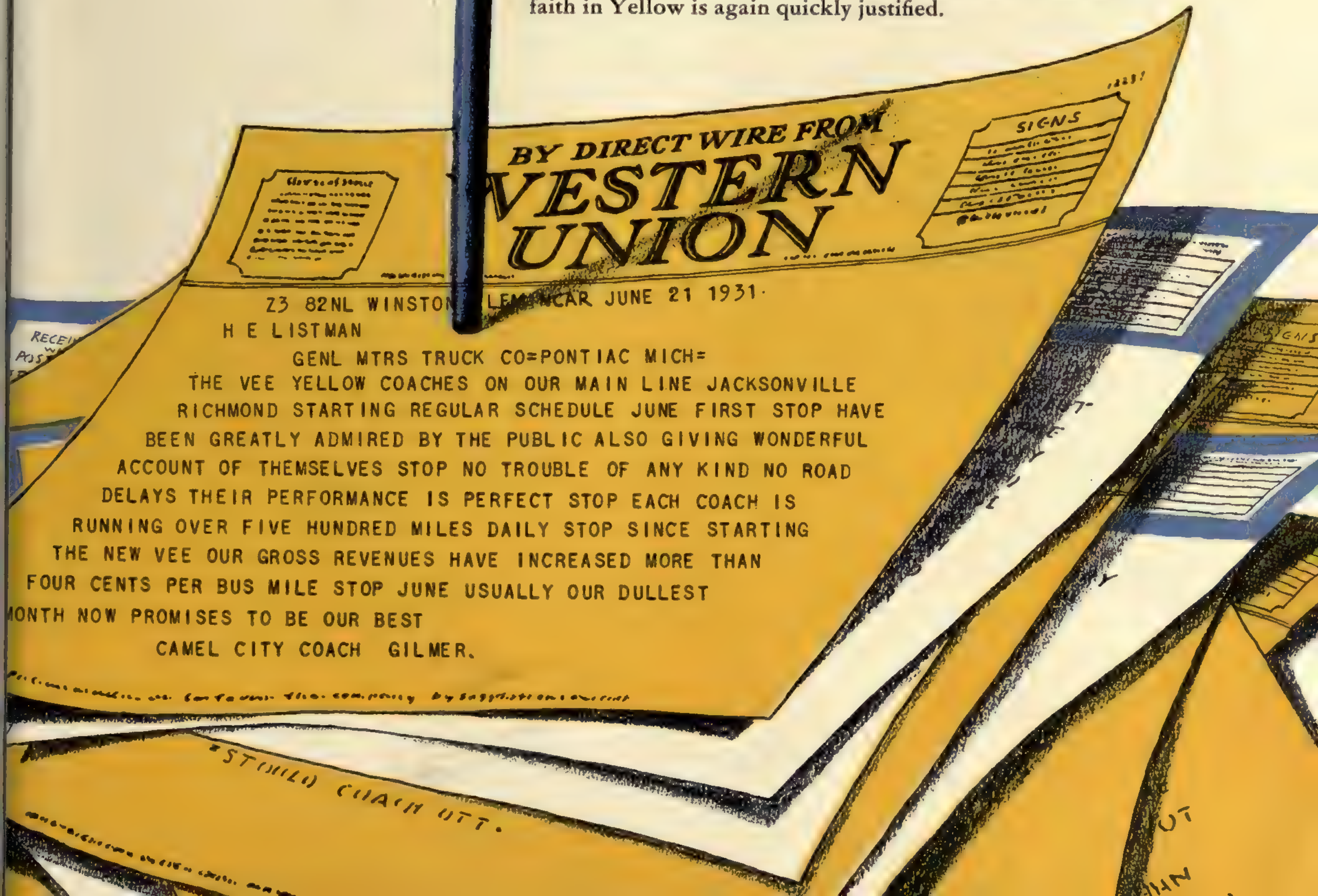
That's confidence on the part ot the automobile company. Confidence in quality and uniformity of the product. Confidence in our ability to ship the required volume, day after day, to the company's numerous assembling plants. Confidence that centering its entire requirements ot this important bolt in one supplier will assure a steady volume and that no assembly line will be held up by shortage or defective stock.

Confidence such as that, built up in years of satisfying contact, is significant to every large consumer of bolting material. If you have any manufacturing problems involving the use of bolting material, you are invited to utilize the experience and facilities of the R B & W Engineering Service. It has solved many interesting problems, including simplification and reduced costs.

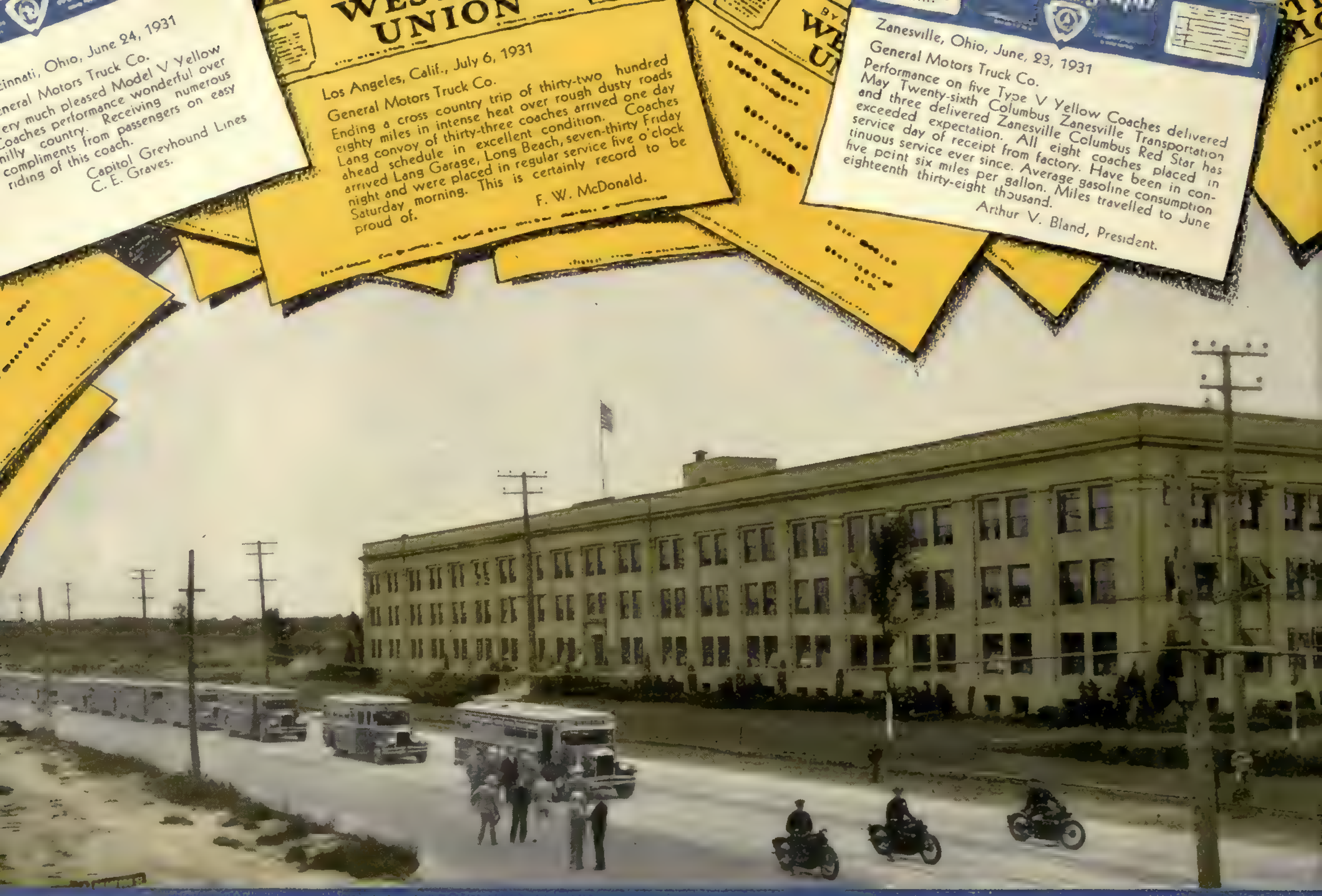
RUSSELL, BURDSALL & WARD BOLT & NUT CO.
ROCK FALLS, ILL. PORT CHESTER, N. Y. CORAOPOLIS, PA.
Sales Offices at Philadelphia, Detroit, Chicago,
San Francisco, Los Angeles, Seattle, Portland, Ore.

already YELLOW type V *has achieved nation-wide acceptance*

From East and West, North and South, come telegrams praising Yellow Type V performance—and Type V is less than four months old! Such instantaneous response is typical of what happens when Yellow introduces a new type. Promises of greater revenue, easier maintenance, more passenger comfort and exceptional dependability are being realized by Type V users—operators whose faith in Yellow is again quickly justified.



Z3 82NL WINSTON LEM NCAR JUNE 21 1931
H E LISTMAN
GENL MTRS TRUCK CO=PONTIAC MICH=
THE VEE YELLOW COACHES ON OUR MAIN LINE JACKSONVILLE RICHMOND STARTING REGULAR SCHEDULE JUNE FIRST STOP HAVE BEEN GREATLY ADMIRED BY THE PUBLIC ALSO GIVING WONDERFUL ACCOUNT OF THEMSELVES STOP NO TROUBLE OF ANY KIND NO ROAD DELAYS THEIR PERFORMANCE IS PERFECT STOP EACH COACH IS RUNNING OVER FIVE HUNDRED MILES DAILY STOP SINCE STARTING THE NEW VEE OUR GROSS REVENUES HAVE INCREASED MORE THAN FOUR CENTS PER BUS MILE STOP JUNE USUALLY OUR DULLEST ONTH NOW PROMISES TO BE OUR BEST
CAMEL CITY COACH GILMER.



innati, Ohio, June 24, 1931

eneral Motors Truck Co.

ery much pleased Model V Yellow Coaches performance wonderful over hilly country. Receiving numerous compliments from passengers on easy riding of this coach.

Capitol Greyhound Lines
C. E. Graves.

Los Angeles, Calif., July 6, 1931

General Motors Truck Co.

Ending a cross country trip of thirty-two hundred eighty miles in intense heat over rough dusty roads Lang convoy of thirty-three coaches arrived one day ahead schedule in excellent condition. Coaches arrived Lang Garage, Long Beach, seven-thirty Friday night and were placed in regular service five o'clock Saturday morning. This is certainly record to be proud of.

F. W. McDonald.

Zanesville, Ohio, June, 23, 1931

General Motors Truck Co.

Performance on five Type V Yellow Coaches delivered May Twenty-sixth Columbus Zanesville Transportation and three delivered Zanesville Columbus Red Star has exceeded expectation. All eight coaches placed in service day of receipt from factory. Have been in continuous service ever since. Average gasoline consumption five point six miles per gallon. Miles travelled to June eighteenth thirty-eight thousand.

Arthur V. Bland, President.

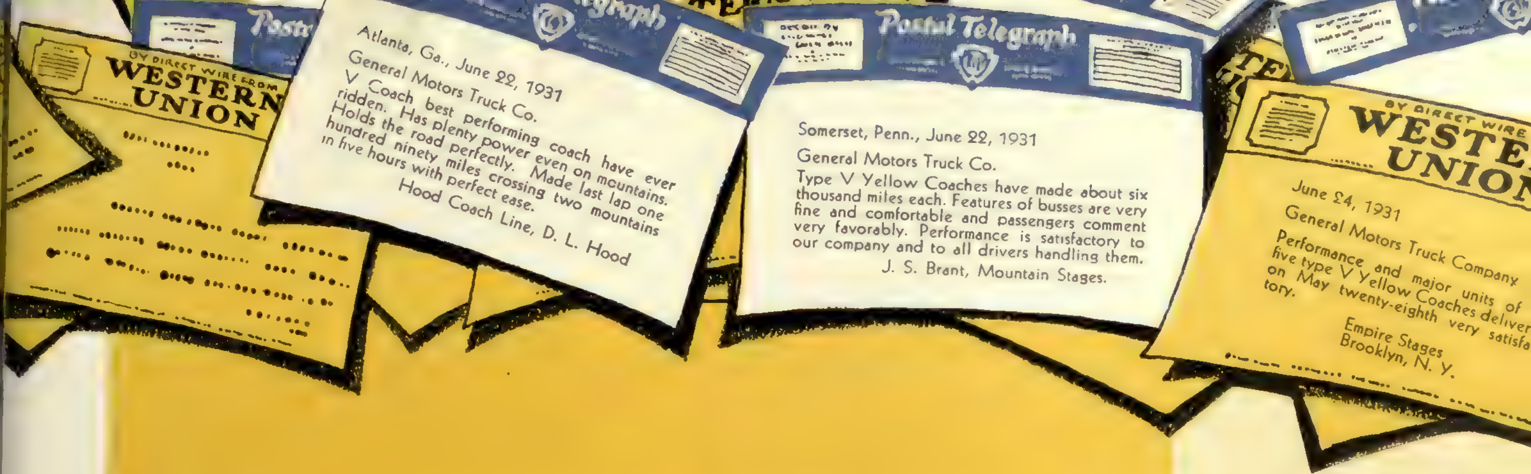
The GREATEST *transcontinental*

A caravan of Yellow Coaches a mile and a half long—33 in all, representing an investment of $300,000 by the Lang Transportation Company of Long Beach, California.

Straight through from the General Motors Truck plant at Pontiac, Michigan, to the Coast, headed this mile and a half long caravan under its own power—following modern highways that once beckoned the covered wagon along their dusty trails.

To the click of news reel cameras and the warning note of police escort sirens, this ultra-modern cavalcade pointed West on June 22nd.

To many en route, the spectacle was but an impressive procession of motor coaches—the greatest number that had ever braved mountainous climbs and desert stretches to the Pacific. To others, whose knowledge and experience led them to look deeper, this $300,000 train represented an investment in ten million miles of profitable transportation service and symbolized the returning era of business confidence and prosperity.


By direct wire from
Western Union
Postal Telegraph
Postal Telegraph
By direct wire
Western Union

Atlanta, Ga., June 22, 1931
General Motors Truck Co.
V Coach best performing coach have ever ridden. Has plenty power even on mountains. Holds the road perfectly. Made last lap one hundred ninety miles crossing two mountains in five hours with perfect ease.
Hood Coach Line, D. L. Hood

Somerset, Penn., June 22, 1931
General Motors Truck Co.
Type V Yellow Coaches have made about six thousand miles each. Features of busses are very fine and comfortable and passengers comment very favorably. Performance is satisfactory to our company and to all drivers handling them.
J. S. Brant, Mountain Stages.

June 24, 1931
General Motors Truck Company
Performance and major units of five type V Yellow Coaches deliver on May twenty-eighth very satisfa tory.
Empire Stages
Brooklyn, N. Y.

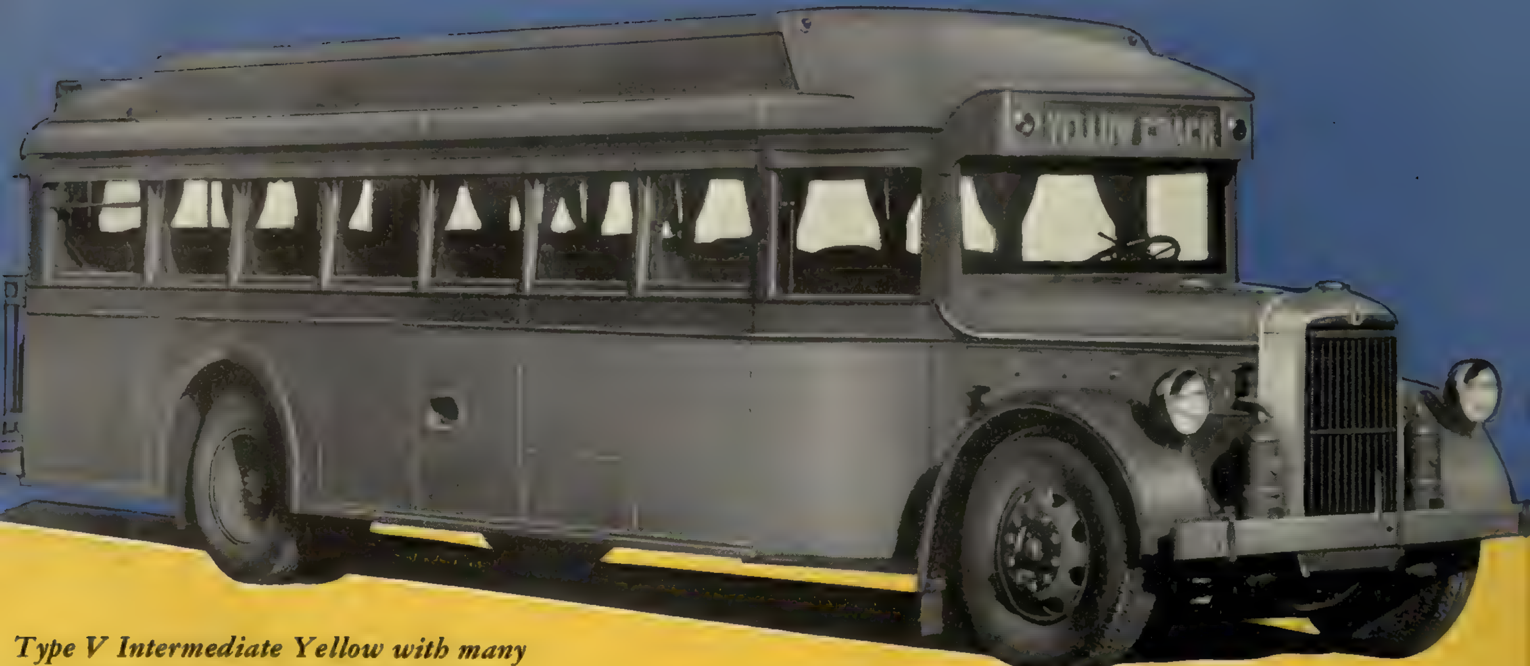
Such a drive-away called for organization — a supply and commissary coach, sleeping accommodations for the desert country, passenger cars used as scout cars to choose the night parking spots, arrange for police escorts or flag railroad crossings, and to render intercommunication service for the fleet.

Without mishap, every coach in this great transcontinental drive-away reached Long Beach, California, July 3rd, *a day ahead of schedule.*

And early the next morning all were in regular revenue-earning service—16 Type V 29-passenger all metal body city coaches, 9 Type Z 38-passenger all metal body city coaches and 8 Type U 25-passenger city coaches.

drive-away in coach history

The Lang caravan of Yellow Coaches reached Long Beach, California, a day ahead of schedule and were in regular revenue service the morning following their arrival.



Type V Intermediate Yellow with many new chassis features, new body features and new power plant.

Promise fulfilled by performance in this new

TYPE V YELLOW COACH

On March 10th, Yellow announced a new type of intermediate capacity coach with many original features.

It was promised that this New Type V would establish a *new measure* for motor coach values in (1) design; (2) stronger yet simplified construction; (3) more power with less fuel; (4) easier handling with less effort; (5) faster schedules with greater safety; (6) greater mileage with positive dependability; (7) quicker, easier maintenance at less expense; (8) greater passenger appeal and travel comfort; (9) more value for less money.

Almost before the ink was dry on the announcement, orders received again proved the confidence held by operators toward Yellow's equipment. In less than four months, performance on the road has won *re-orders.* Almost a million dollars of Type V Yellow Coaches are now in service—all of them performing in a manner above ordinary.

Repeatedly do the telegrams received from Type V owners comment on regularity of service, high mileage per gallon of gasoline, passenger appeal and comfort, power on hills, high daily mileage and increased revenues.

Both in the great transcontinental drive-away just completed and in the fulfillment of promises made for the New Type V, Yellow has written significant records on the pages of motor coach history.

GENERAL MOTORS TRUCK CO.
Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

Already an outstanding success

type V YELLOW COACHES

DAVIS "ONE-WEAR" STEEL WHEELS

THE MODERN STEEL WHEEL THAT NEEDS NO MAINTENANCE

LIGHT WEIGHT—

Due to its special composition steel the Davis Wheel can be made lighter in weight without sacrifice of strength.

STRENGTH—

Heat treatment develops in each part of the Davis Wheel precisely the characteristics needed to best fit it for work to be done.

ONE-WEAR—

Special composition steel and triple heat treatment provide unique qualities that make the Davis Wheel truly "One-Wear."

ASF

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

PSSSSSSSSSSSSST

goes the Air Brake . . . and a smooth, positive, tremendously powerful stopping force has spoken ★ A constant assurance of an instant available power-to-stop, this *voice of safety* identifies Bendix-Westinghouse Automotive Air Brakes as the ultimate in modern, flexible control ★ Aside from their many obvious advantages, Bendix-Westinghouse Brakes are traditionally dependable ★ World-wide, their acceptance as standard equipment by practically every prominent builder of modern, heavy duty highway transportation is conclusive evidence of consistently perfect operation ★ Fortunately, due to their extreme simplicity, Bendix-Westinghouse Air Brakes are not limited entirely to factory installation ★ Through a nation-wide network of authorized distributors, any vehicle may be readily adapted to air brake control ★ The result of more than a half century's development and manufacture this modern power braking equipment is available to you . . . a time-tested product of the two greatest names in braking ★ Perhaps you have a question concerning a particular phase of modern power braking, or maybe general information on the subject would be of interest ★ Without obligation, your request will bring an immediate response ★ Address: BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

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SAFETY
STANDARD
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THE WORLD

BENDIX ★
WESTINGHOUSE
AUTOMOTIVE ★ AIR ★ BRAKES

Helps to protect your profits
SPECIAL

KOOLMOTOR OIL

Cools as it lubricates

PICNICS, outings, vacationists bring good business in summertime ... you carry heavy loads ... motors are taxed to capacity—especially in hot weather. To keep your heavy-duty engines in service—working profitably for you during this season of heavy demand they need protection against heat, wear, friction and unnecessary repairs and breakdowns.

KOOLMOTOR OIL—the *perfect* Pennsylvania motor oil—offers that protection because it *cools* as it lubricates. Special Cities Service refining processes employing *moderated* temperatures enable KOOLMOTOR OIL to *absorb* searing heat and *carry it away* from hot friction surfaces and bearings.

Remember — unprotected hot engines are costly—they may go out of service just when you need them most. To be safe use KOOLMOTOR—the oil that does *more than* lubricate—the oil that *cools* as it lubricates. Our representative will gladly call and tell you more about it.

CITIES SERVICE COMPANY
60 Wall Street • New York

CITIES SERVICE OILS
ONCE - ALWAYS

Cities Service Radio Concerts
Fridays, 8 P. M., Eastern Daylight Time, WEAF and 37 Associated Stations on N.B.C. Coast-to-Coast Network — Cities Service Orchestra, Cavaliers and Jessica Dragonette.

Cities Service Oils and Gasolene

The SAFETY CAR . . .
CONTROL EQUIPMENT

» » » » INCREASES
Safety of Operation

INTERLOCK feature permits centralized operating responsibility . . . prevents opening of doors before car stops, or starting of car before doors close . . . and causes an emergency brake application if controller handle is released due to motorman's negligence or disability while car is in motion.

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OF ST. LOUIS, MO.
Postal and Telegraphic Address:
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CHICAGO SAN FRANCISCO NEW YORK
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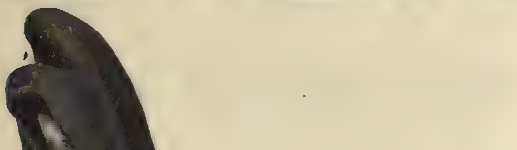
ART RATTAN
QUALITY
speaks in terms of
LOWER MAINTENANCE

Type P-112



Type
U-106

Not on appearance alone can you judge a bus seat. You have to dig beneath the surface to see the hidden quality of materials built in—of sturdy construction—of correct design embodied in Art Rattan Seats.

But what does this mean to the operator? Just this. A seat that stands the wear and tear of rough usage with little or no repair costs. Actual cost records, from operating companies, show maintenance expense over a period of years to be *less than a fraction of one percent of the total seat investment.*

In addition, you get a trim appearing seat, offering passenger comfort plus rider appeal in Art Rattan seats.

It will pay you to dig into the facts concerning Art Rattan seats for reducing maintenance and increasing revenue.

Art Rattan Works, Inc
Cleveland, Ohio.........Oakland, California

BUILDERS OF DE LUXE BUS AND STREET CAR SEATS

Mr. Frank Martz, President of the Frank Martz Coach Company, Inc.

Frank Martz finds Silvertowns

"..The ultimate in safety and service"

A few of the 125 buses in the Frank Martz Fleet

FROM the Atlantic Seaboard to Chicago—up rough mountain trails—over fast, scorching highways—through congested city streets. Over the 3,000,000 miles of this grueling route Goodrich Bus Balloons safeguard the Frank Martz fleet every year.

"For the past ten years," writes Mr. Martz, "I have been using Goodrich Tires. During the past two years I have used Goodrich Silvertown Bus Balloons exclusively. It is a real satisfaction to know that my bus equipment is operating on a tire that is the ultimate in Safety and Service."

The B. F. Goodrich Rubber Co., Est. 1870, Akron, Ohio. Pacific Goodrich Rubber Co., Los Angeles, Cal. In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont. The International B. F. Goodrich Corp. (Export).

JOIN THE SILVERTOWN SAFETY LEAGUE

Like other leading bus operators, Mr. Martz is an enthusiastic supporter of this nation-wide drive to save lives. Each coach in his fleet bears the shining safety emblem—each driver wears a Safety League button and has pledged support to the nine League rules for safer driving. Show your patrons where *you* stand. Join the Silvertown Safety League today. Pledges, lapel buttons and emblems for your drivers may be had without cost or obligation from your nearest Goodrich Distributor.

Goodrich *Bus* Balloons

SPECIFY GOODRICH ON YOUR NEW BUSES

SHOPPERS from the suburbs find that Collier Service Car Cards fill a real need. The car cards are last minute reminders and a buyer's catalogue in full color. They are a catalogue of products on which riders may rely—products which have passed a rigid censorship.

CAR CARD
ADVERTISING
ALMOST
EVERYWHERE

Merchants and manufacturers buy Car Card Advertising because they know it helps to increase business. Business is the basis of traffic.

And so Car Card Advertising as a service to riders—as a builder of traffic—and as a source of reliable income to electric railway companies as well—has the support and endorsement of Electric Railway Operators.

Barron G. Collier
INCORPORATED

Monotube Pole with ornamental base used for distribution lines and trolley span wire support.

LET'S TALK about POLE COSTS

COSTS come in for plenty of attention these days. Every dollar must be stretched just a little farther.

About pole costs. Union Metal Monotubes fall in the low price range. Compare them with other steel poles—strength for strength—you'll find the prices right in line.

Then consider the advantages incorporated in Monotubes which you do not get in other poles—one-piece construction, no horizontal joints, choice of two types of anchorage, cold-rolled steel, better appearance—all for the same price as ordinary poles. And because Monotube construction reduces corrosion to a minimum, these poles last longer.

Install Monotubes jointly with other utilities. Use them for distribution lines, trolley span wires, feeder lines, traffic signals or what you will. Monotubes will cut costs for you year after year.

At whatever price you wish to pay for poles or for lighting standards, Union Metal offers you an outstanding buy. The line is complete. There is a pole—Monotube or Fluted Steel—and lighting standard—Pressed Steel or Ferronite (super cast iron)—to match every requirement of style and price. Write us for complete information or request a Union Metal engineer to call.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY ♦ ♦ CANTON, OHIO

SALES OFFICES: New York, Chicago, Boston,
Los Angeles, San Francisco, Dallas, Atlanta

Distributors:
General Electric Merchandise Distributors
Graybar Electric Company, Inc.
Offices in all principal cities

Abroad: The Canadian General Electric Co.;
The International General Electric Co. Inc.

UNION METAL MONOTUBE POLES

WHEN People get more Comfort at lower Cost in Travel they leave their Cars at home

Put your
BEST
in the
SEAT

Use
KARPEN

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MILLIONS of miles of actual service prove that Karpen Seats are the economical choice for railroad or bus, electric car or trolley coach. For thirty-six years, Karpen has been building better seats for transportation companies...seats whose reputation throughout that long period has been based on *lower costs per seat-mile.* Craftsmanship, comfort and low maintenance,...you are assured of all three in Karpen Seats, for new equipment or for replacement.

S. KARPEN & BROS.

Transportation Seating Dept., Chicago

New York Michigan City, Ind. Los Angeles

KARPEN Guaranteed FURNITURE

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TEXACO LUBRICATES THESE CHICAGO BUSES

▪ Texaco Lubricants are making excellent performance records on the modern trolley buses of the Chicago Surface Lines. They have proved their effectiveness in lowering maintenance costs under particularly severe operating conditions.

There are 114 trolley buses now in service. Original service started with 29. All of these buses run upward of 3600 miles per month each. Texaco Lubricants, including Texaco Marfak Grease and Texaco 569 Gear Oil W are used.

This is another fine example of the many notable systems throughout the country which are today Texaco lubricated. There is a Texaco Lubricant for every purpose. Write The Texas Company. Ask about Texaco Lubricants and Texaco Engineering Service.

THE TEXAS COMPANY, 135 East 42nd Street, New York City

TEXACO
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TEXACO LUBRICANTS

One of 11 stocks of electrical insulations *which assure prompt delivery*

SERVICE is and always will be paramount . . . not alone the promptness with which orders are filled, but also the unsurpassed performance which Mica Insulator Company's products assure.

We offer you one source of supply for practically every commercial insulation. Micanite and Super-Micanite bonded mica; Lamicoid laminated Bakelite; Empire Varnished (Oiled) Cloths and papers; Mica Varnishes, compounds, tapes and untreated insulations.

Catalog 87 gives complete information, including recommended uses for every product of the Mica Insulator Company. A copy is yours for the asking.

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MICA INSULATOR COMPANY

Electrical Insulations

LAMICOID — MICANITE — EMPIRE — MICO

A COMPLETE LINE FOR EVERY PURPOSE

$625 for
REO Quality
REO Speed
REO Economy
REO Long Life

Four-Cylinder $625, Six-Cylinder $725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

THE new Reo SPEED WAGON sweeps aside all previous work-limitations of trucks in the lowest price class. It fulfills *entirely* the exacting 1½-ton haulage demands of *every* industry.

REO has met the low-price 1½-ton market with the finest truck that sound engineering, extensive factory facilities and ample capital have yet been able to produce. *For comparable quality, size and specifications the new SPEED WAGON is the lowest priced 1½-ton truck in the world!*

REO MOTOR CAR COMPANY, LANSING—TORONTO

THE NEW
1½ TON
REO
SPEED WAGON

Extra Size, Extra Strength, Extra Power, with assured lower per-mile cost of operation

4 cylinder engine—5 bearings • 6 cylinder engine—7 bearings • Chrome nickel iron cylinders • Extra large piston displacements • Force feed lubrication Strong channeled frame—7" deep • Four Speed Transmission • Full floating rear axle • Forged Spoksteel Wheels • Internal hydraulic brakes

Two liberal wheelbase lengths
More loading space behind cab.

AVAILABLE WITH STANDARD AND SPECIAL BODIES FOR EVERY HAULAGE NEED

These Buses Average 282,635 MILES

without road delay!

Washington
Railway and Electric Company Makes
Big Savings With Firestone Bus Balloons and Firestone Service.

IN 1930 the 125 buses operated by this company travelled 3.674.266 miles on asphalt and brick with only thirteen tire road delays or 282.635 miles average. Since 1926 mileage has doubled, yet road delays have been reduced from two hundred fifty-four to thirteen—a reduction in time lost from 4,470 minutes delay in 1926 to only 209 minutes in 1930.

Such performance is the result of Firestone's inbuilt construction features, including — Gum-Dipped Cords — Patented Double Cord Breaker — Tough Thick Non-Skid Tread, which provides,—

58% longer flexing life in every cord
26% greater protection against punctures and blowouts
56% stronger bond between tread and cord body
25% longer non-skid wear
25 to 40% longer tire life

See the Firestone Service Dealer near you today. Let him show you how Firestone Bus Balloons and Firestone Service will save you money and serve you better.

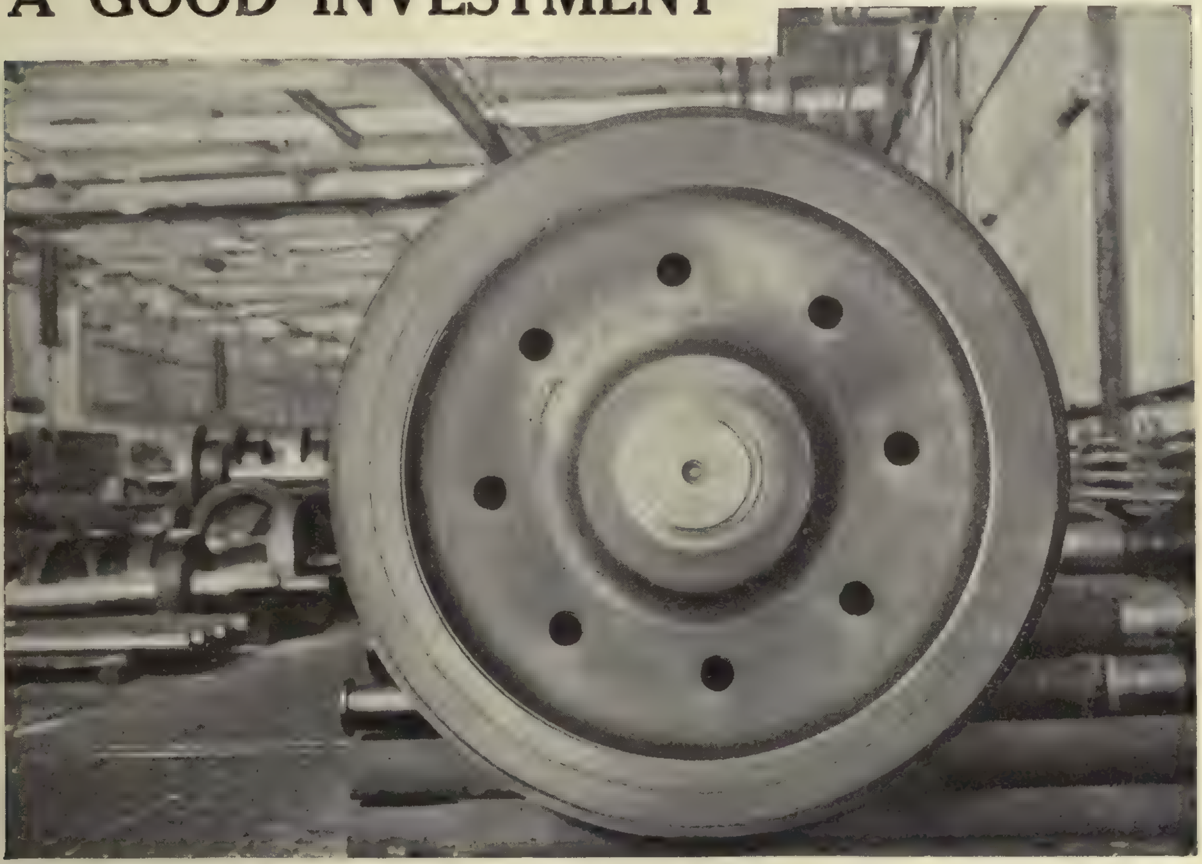
Firestone

BUS BALLOONS

TIRES • TUBES • BATTERIES • RIMS • BRAKE LINING • ACCESSORIES

Copyright, 1931, The Firestone Tire & Rubber Co.

A GOOD WHEEL IS A GOOD INVESTMENT



USE a wheel that will wear long and avoid the expense of changing wheels except after long intervals. In these days of quick starts and stops, high running speeds and heavy loads, the wheel is a very important and often expensive piece of equipment. Standard Steel Wheels *are* standing up and lasting long—a good investment for all operators.

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Trolley Shoes pay their own way..

Maintenance engineers experienced in trolley shoe use say very emphatically that the savings effected in wear on overhead equipment—and elimination of trolley brakes—more than pay for the initial installation of

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Reversible Trolley Shoes

Let's talk it over

Efficiency Products Corp.
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PANTASOTE
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—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

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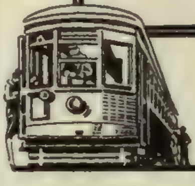
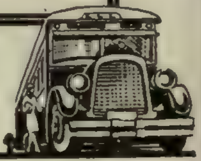
—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses



Samples and full information gladly furnished.



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Long Wearing

Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

1. Long Life
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4. Fireproof
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TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
PEOPLES GAS BLDG.,
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MAINTAIN YOUR SAFETY RECORDS

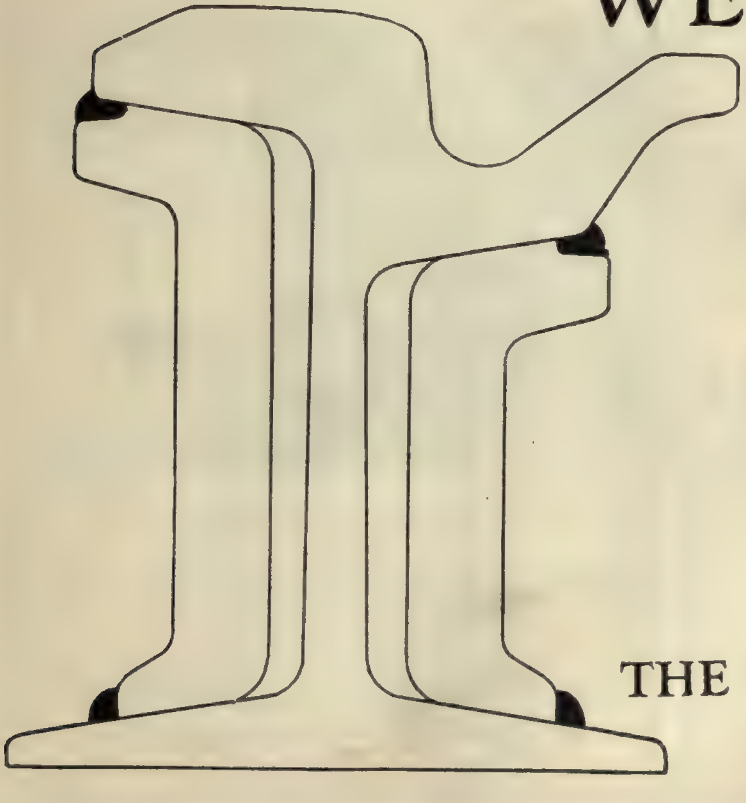
IN the face of heavy traffic which daily crosses interurban and electric traction lines, these lines have created enviable safety records. Maintain them! At each highway or grade crossing there should be protection not only for automobile or pedestrian but for the car as well. "Union" Highway Crossing Protective apparatus protects. It speaks a universal language, saying, "A car is coming." It gives this positive service 24 hours each day. And it gives the greatest protection for the least expense.

1881 **Union Switch & Signal Co.** 1931
SWISSVALE, PA.

"WELD PLATES"

For EFFICIENT, ECONOMICAL

JOINTS



Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

THE RAIL JOINT COMPANY
165 Broadway, New York

"DIXIE" LONG LEAF YELLOW PINE POLES

Have Set a New Standard

Cut from our own stands of dense Long Leaf Yellow Pine timber, Dixie Poles include the factors of supreme strength, freedom from knots, and provide uniformly clean-bodied stock. The sorting, grading and seasoning of Dixie Poles are conducted on a large scale with comprehensive facilities for every step from tree to car.

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A CROSSETT WATZEK GATES INDUSTRY

Locating Defective Bonds!

ROLLER-SMITH BOND TESTERS

Why permit defective rail bonds to interfere with current return through the rails? Why stand for continuous power losses? Why risk electrolysis damage?

Find those broken bonds with a Roller-Smith Bond Tester. It's *a one man* proposition, accurate, direct-reading, easily handled and fast. Fits every kind of rail-head.

Bulletin G-200 describes different types of testers. Write for this Bulletin.

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Electrical Measuring and Protective Apparatus

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NEW YORK

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Offices in Principal Cities in U. S. and Canada

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED

LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

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TO EVERY MAN who subscribes to the Library of Electrical Maintenance and Repair NOW we will give a copy of Croft's American Electricians' Handbook—the most popular, the most used handbook of electrical data published. No charge for it—it comes to you FREE with this helpful maintenance and repair library. As there is only a limited supply of handbooks available for free premium distribution we suggest prompt action.

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5 volumes—1810 pages—1756 pictures and diagrams

THIS library contains the largest collection of practical methods for electrical repair and maintenance men ever put together in book form. Here you will find the best modern practice in repair work. The authors have drawn not only from their own extensive experience, but from the experience of electrical maintenance men in large and small repair shops and manufacturing plants throughout the country.

Every maintenance and repair man needs them

EVERY man concerned with the care and repair of electrical machinery should have these practical books. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong.

The books contain hundreds of photographs, diagrams and tables, which show you how to go about it to make an effective repair job. There are wiring diagrams covering A.C. and D.C. generators, feeders, transformers, potential regulators, synchronous converters, batteries and boosters, substations, lamp mechanism connections, rheostats and controllers, lightning arresters, automobile switches, railway controllers, etc.

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Fill in and mail the coupon attached and we will send you the entire set of five volumes for ten days' Free Examination. We take all the risk — pay all charges.

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Upon receipt of your first payment we will send you a free copy of The American Electricians' Handbook.

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Gentlemen:—Send me the **Library of Electrical Maintenance and Repair**, all charges prepaid, for 10 days' Free Examination. If satisfactory I will send $1.00 in ten days and $2.00 a month until $15.00 has been paid. If not wanted I will return the books at your expense. Upon receipt of my first payment you are to send me a free copy of **Croft's American Electricians' Handbook.**

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Name of Company ....

Occupation .... E. 8-31

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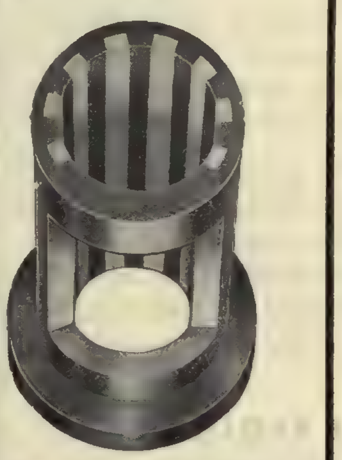
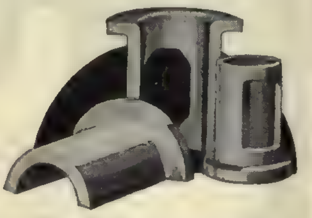
"NATIONAL" ELECTRIC RAILWAY Specialties

Due to long contact with the industry we have valuable operating data that is available for the asking. Let our specialists cooperate with you. Prices and full details submitted upon request.



The "Vigne" Bimetallic Armature Bearing

"More-Jones" Trolley Wheels and Harps



"Tiger" Bronze Axle and Armature Bearings

"Armature" Babbitt Metal

NATIONAL Bearing Metals Corporation

ST. LOUIS, MO.

New York, N. Y. Jersey City, N. J. Pittsburgh, Pa.
Meadville, Pa. Portsmouth, Va. St. Paul, Minn.

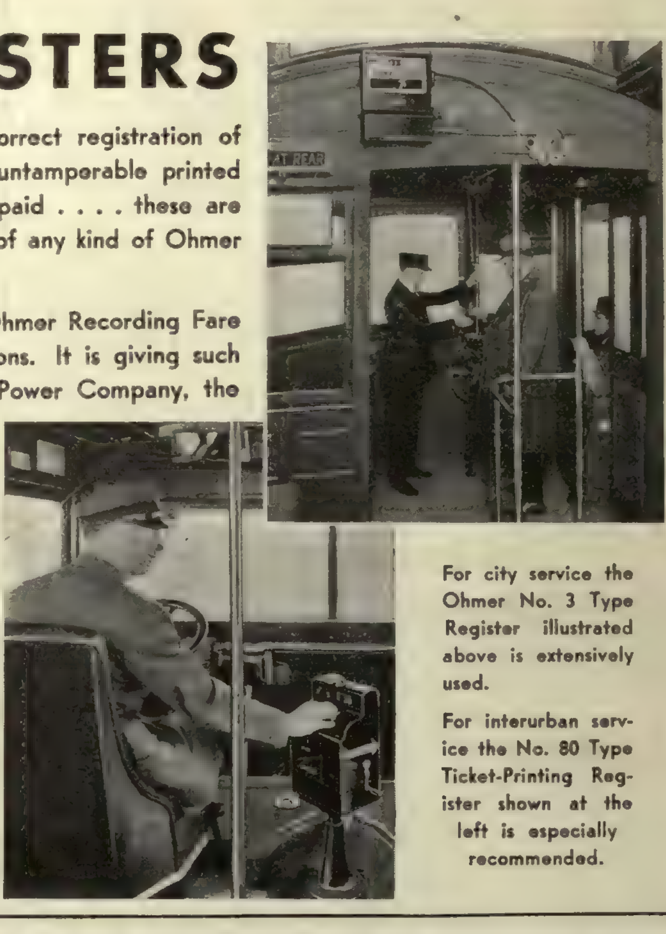
OHMER REGISTERS

A CLEAR indication of the fare paid, the correct registration of the fare paid, the permanent entry on an untamperable printed record of all the facts relating to the fare paid . . . . these are Ohmer System essentials inseparable from the use of any kind of Ohmer Fare Registers.

In addition to serving interurban railways, the Ohmer Recording Fare Register is used extensively in city railway operations. It is giving such outstanding operating companies as the Georgia Power Company, the International Railway Company, the Indiana Railroad, and many others, a complete check of the revenue derived from passenger transportation.

A late transportation system to adopt Ohmer Ticket-Printing Registers is the Buckeye Stages, Inc., of Columbus, Ohio. These registers were installed in twenty coaches operating over an area extending from Cincinnati to Cleveland and comprising ten different divisions with ninety-nine fare limits.

OHMER FARE REGISTER CO.
DAYTON, OHIO, U. S. A.



For city service the Ohmer No. 3 Type Register illustrated above is extensively used.

For interurban service the No. 80 Type Ticket-Printing Register shown at the left is especially recommended.

GENUINE LEATHERS
in Full Chrome or Bark Tannage for Transportation Upholstery

Write for Sample Books and Prices

America's Largest Producers

GENERAL LEATHER CO.
Newark, N. J.

Makers of the Famous Velvelea and Tried and Proven "00" Leathers

Detroit Office:
General Leather Co.
414 Fisher Bldg.

Chicago Office:
Hopkins & Benedict Co.
Railway Exch. Bldg.

Colonial Traders, Inc.,
77 Williams St., Chatham, Ont.

R. & A. Kohnstamm, Ltd.,
21 West Smithfield,
London, E. C.

West Coast Offices:

A. J. & J. R. Cook, Inc.,
237 Eighth St., San Francisco

Railway & Transportation
R. W. Arlin,
Delta Bldg., Los Angeles

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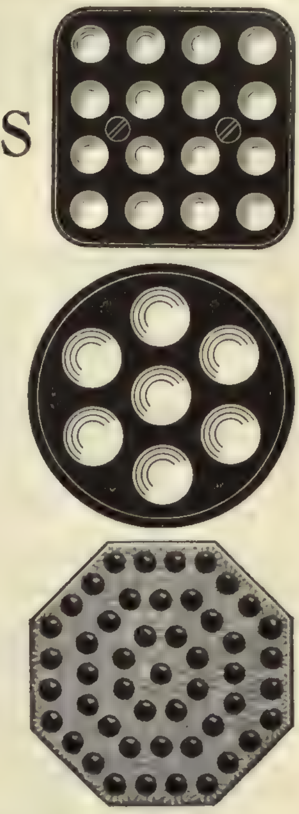
THERMOSTATIC CONTROL
STEAM HEATERS FOR BUSES
COMPLETE PNEUMATIC DOOR AND STEP OPERATING EQUIPMENT
HIGH & LOW VOLTAGE BUZZERS & BELLS
SAFETY SWITCHES
SAFETY SWITCH PANELS

CONSOLIDATED CAR-HEATING CO., INC.
NEW YORK ALBANY CHICAGO

REFLEX
SIGNS AND SYMBOLS

are used on steam and electric roads
advantageously



Crossing Signs; Switch Lamps; Bus Markers;
Safety Isle Markers, Etc.

They save you money

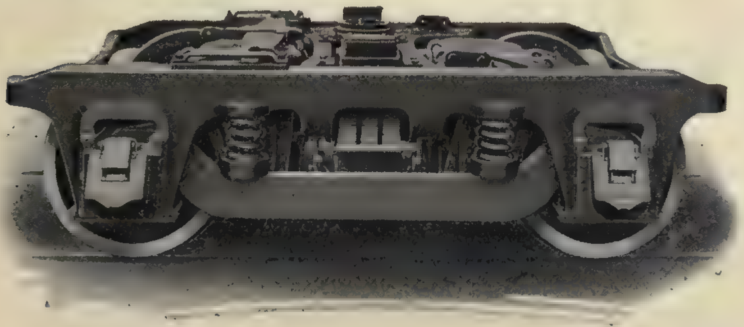
Ask for Bulletin 23-A

LOUISVILLE FROG, SWITCH & SIGNAL CO.
LOUISVILLE, KENTUCKY

Commonwealth "SWING MOTION"

Trucks . . . . . .

Rugged *Construction—*
Long *Life—*
Freedom *from Costly Maintenance—*
Economical *for Any Service*



Investigate thoroughly the merit of Commonwealth Trucks. See how these trucks fully meet your service requirements. See why their past performance records make them the logical trucks for you to standardize on. The cast steel frame, including cross transoms and pedestals, is one strong unit. Commonwealth Trucks are designed for both street car and interurban service. We will be glad to cooperate with you in the satisfactory solution of your present truck problems.

GENERAL STEEL CASTINGS CORPORATION

GRANITE CITY, ILL. EDDYSTONE, PENN.

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ELECTRIC RAILWAY ENGINEER
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ENGINEERS
for the
FINANCING—REORGANIZATION —DESIGN—CONSTRUCTION
of
INDUSTRIALS and PUBLIC UTILITIES

Chicago New York San Francisco

The P. Edward Wish Service

50 Church St., NEW YORK

Street Railway Inspection
DETECTIVES

131 State St., BOSTON

SEPTEMBER ISSUE
Closes August 21st

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

ELECTRIC RAILWAY JOURNAL

STANDARDIZE ON

Glass

up to 15,000 volts

Complete stocks of standard types always on hand.

Because it is
TRANSPARENT
—Internal defects easily seen.

NON POROUS
—will not absorb moisture—sustains dielectric strength and will not age or deteriorate.

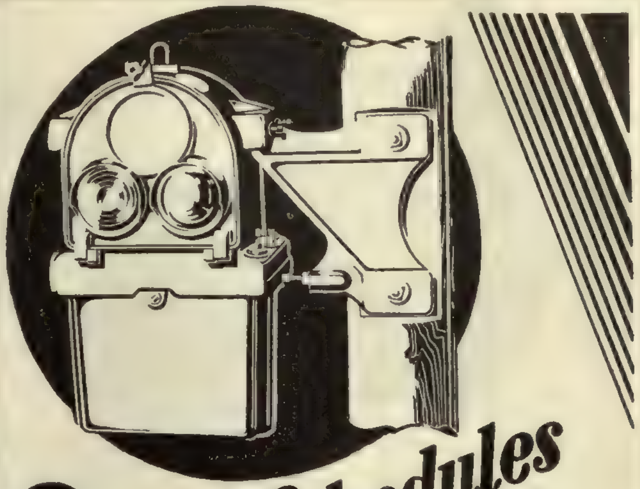
COSTS LESS
—in the first place—lasts longer with fewer replacements.

Get Full Details

HEMINGRAY

HEMINGRAY GLASS COMPANY

General Offices and Factory Muncie, Indiana



Faster Schedules

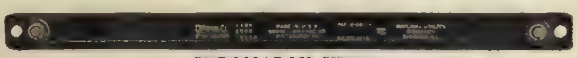
Nachod Automatic Block Signals, operating independently of the train crew, insure safe, fast operation and eliminate vexatious delays at switches. They take chance and memory out of the picture . . . provide maximum safety under all conditions of operation. Block and Highway Crossing Signals, Headway Recorders. Nachod & U. S. Signal Co., Inc., Louisville, Ky.

"Nachod Spells Safety"

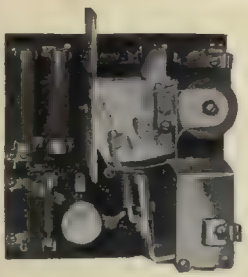
NACHOD SIGNALS

Utility Car Heaters fitted with

ENCLOSED HEATING elements carry the Underwriters' Laboratories Label. They give 100% energy output for what you put in.



CHROMALOX STRIP



UTILITY HEAT REGULATORS economize in current consumption.

UTILITY HONEYCOMB VENTILATORS keep the air pure and wholesome.

Car Comfort *with* Utility Heaters Regulators Ventilators

RAILWAY UTILITY COMPANY
2241-47 Indiana Ave., Chicago
J. H. DENTON, *Eastern Mgr.*
1328 Broadway, New York

CHOSEN for PERFORMANCE

TROLLEY wheels are never chosen for looks, never selected because one kind costs a little more or less than another. They're chosen for performance. That's why

KALAMAZOO

trolley wheels and harps are the standard of comparison today. That's why many properties use them exclusively. There's a difference in trolley wheels. May we tell you about it?

THE STAR BRASS WORKS
KALAMAZOO, MICHIGAN

Don't throw away waste and wiping cloths!

NO MATTER how grimy and oil-soaked waste and wiping cloths may be, you can reclaim them at a fraction of the cost of replacing them. And in addition, these washed cloths will be softer and more absorbent than new.

As, for example, a Pacific Coast road finds reclaiming cloths the Oakite way so economical that they now wash out printed and painted advertising banners which have been displayed on the sides of their cars. The rags obtained are re-used for window washing and similar purposes.

It will pay you to investigate this and other Oakite money-saving methods. Write and ask to have our nearest Service Man give you more information. No obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG U S PAT OFF
Industrial Cleaning Materials and Methods

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SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch	$6.00
2 to 3 inches	5.75 an inch
4 to 7 inches	5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. R.J.

COPY FOR NEW ADVERTISEMENTS ACCEPTED UNTIL 3 P. M. ON THE 20TH FOR THE ISSUE OUT THE FIRST OF THE FOLLOWING MONTH

DISMANTLING?

Let us handle this for you. We specialize in buying and dismantling entire railroads, street railways, industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.

Consult us also about New and Relaying Rails—all weights and sections. You will like our service.

The Perry, Buxton, Doane Company

(Capital $1,000,000.00)

Boston Office, P. O. Box 5253, Boston, Mass.
Pacific Sales Office—Failing Building, Portland, Oregon

POSITION WANTED

ASSISTANT superintendent equipment, 17 years' experience. Maintenance of equipment and electrical engineering, air brake. Location, anywhere. PW-253 Electric Railway Journal, Tenth Ave. at 36th St., New York.

ARMATURE winder, electrician, 15 years' experience; references furnished; go anywhere on short notice. PW-248, Electric Railway Journal, 883 Mission St., San Francisco, Cal.

MASTER Mechanic, 20 years' service street and interurban cars and busses overhauling, and maintenance of equipment. Salary and location secondary. PW-247, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

POSITION wanted by graduate electrical engineer with twenty years' experience in street railway operation as superintendent of transportation and transportation engineer. PW-252, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

SECRET service operator available. Fully experienced in inspection work on cars and buses. Capable of organizing secret service inspection department. Free to locate any place. PW-251, Electric Railway Journal, Tenth Ave. at 36th St., New York.

Saving is a good habit, BUT—

Why Save Things You'll Never Use?

WHY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

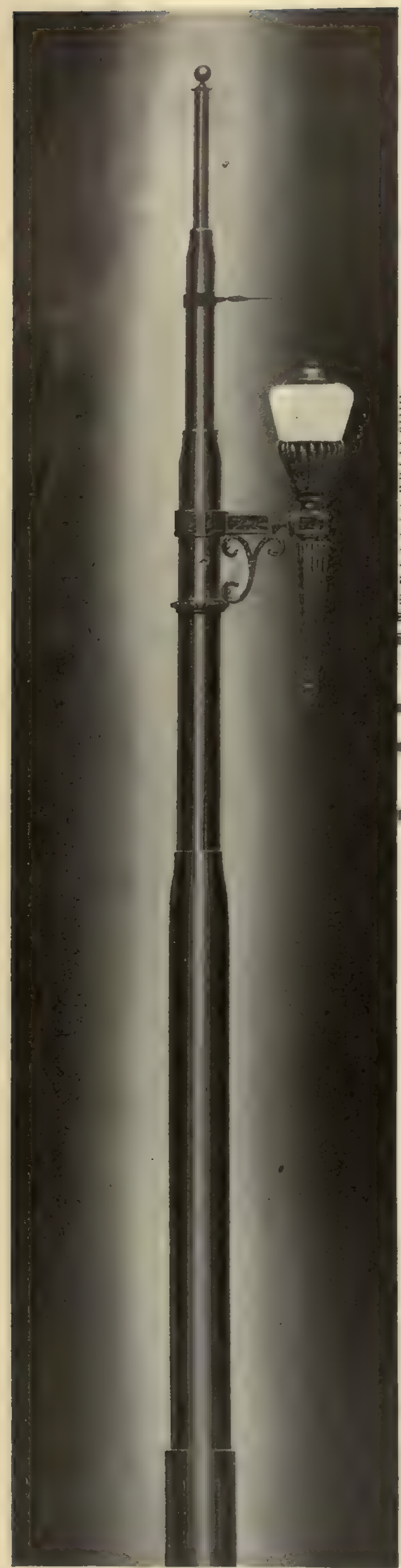
Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department
ELECTRIC RAILWAY JOURNAL
Tenth Ave. at 36th St., New York, N. Y.

ERJ-031



TO BEAUTIFY AND TO BE LASTING !

The graceful, tapering form which makes NATIONAL Tubular Poles an adornment to a city street, results also in a proportioning of weight and strength where both are needed most. Refinement of design has not led to weakness, but incorporates both beauty and durability.

The material used in NATIONAL Poles is a steel specially adapted for the conditions of line-pole service and proved by many years of use. The effect of strains and shocks of traffic, the fury of the elements and attacks of corrosion is reduced to a minimum by installing these strong, durable poles.. Available in varying designs and dimensions. Beauty, safety, and economy are served by specifying them. Write for Bulletin 14, on poles made from—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY · PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL POLES

FUNDAMENTALLY RIGHT

A new era in urban transportation

The success of the modern trolley bus in Chicago and Rockford is convincing proof that it is here to stay. Particularly outstanding in public appeal and economy of operation it appeals to riders and operators alike. An increasing interest also is evidence that railway operators recognize the fact that the electric trolley bus principle is fundamentally right.

THE J. G. BRILL COMPANY
PHILADELPHIA

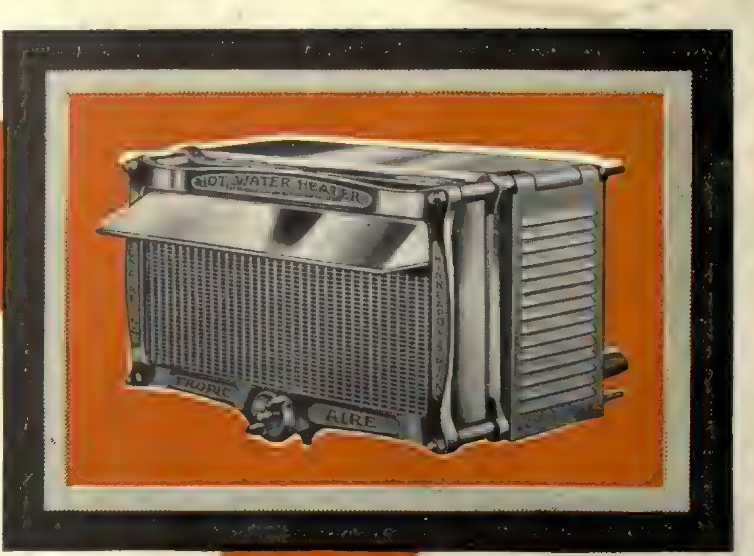
CHICAGO OFFICE - HARRIS TRUST BUILDING
SAN FRANCISCO OFFICE - RIALTO BUILDING
THE J. G. BRILL COMPANY OF OHIO - CLEVELAND
THE J. G. BRILL COMPANY OF MASSACHUSETTS - SPRINGFIELD

Brill Trolley Buses

HOUSTON PUBLIC LIBRARY
HOUSTON
TEXAS

Summer Comfort

for your Bus riders in cold weather



Tropic-Aire Heaters supply sufficient warmth in the coldest weather even with frequent opening of bus doors. Tropic-Aire hot water heat is clean and free from odors. Tropic-Aire Hot Water Bus Heaters prove most dependable in city bus service.

Tropic-Aire Heaters are standard equipment for Public Service Coordinated Transport of Newark, N. J.—Greyhound Lines—Chicago Motor Coach Co., and many other of America's prominent bus companies.

Tropic-Aire Heating Systems are easily installed. They don't require excessive exhaust piping and valves. There is practically no maintenance expense. Tropic-Aire Heaters are designed for all types of buses. They are directly connected to and are a part of the water circulating system. We invite your investigation. Specify and install Tropic-Aire Heaters.

TROPIC-AIRE, Inc.
60 Eleventh Ave., N. E., at Sibley St.
MINNEAPOLIS MINNESOTA

Patent Numbers 1,581,761 — 1,668,491 — RE 17,131 — Others Pending

FANS CIRCULATE HOT WATER HEAT

BOTH FRONT AND REAR HEATERS—
ASK FOR DETAILS

TROPIC-AIRE **HOT WATER** **Bus Heaters**

ELECTRIC RAILWAY JOURNAL

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LOUIS F. STOLL
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Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOSEPH R. STAUFFER
Chicago
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Washington
W. C HESTON
Pacific Coast Editor
ALEX MCCALLUM

Vol. 75, No. 10 JOHN A. MILLER, *Editor* *Pages 495-558*

The

Convention Issue

of

ELECTRIC RAILWAY JOURNAL NEWS

with

Interesting briefs from early conventions
Full program of the meetings
Announcements of special events
Amusing odds and ends of the past
Sketches of prominent executives

And several other features will greet you at Atlantic City on

MONDAY, SEPT. 28

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Inc.
Tenth Avenue at 36th Street
New York, N. Y.

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"MACHINIST, N. Y."

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1931

Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérêt local et de Transports Publics Automobiles.

NEW YORK *District Office, 285 Madison Avenue*
WASHINGTON, *National Press Building*
CHICAGO, *520 North Michigan Avenue*
PHILADELPHIA, *1600 Arch Street*
CLEVELAND, *501 Guardian Building*
BOSTON, *1427 Statler Building*
GREENVILLE, S. C., *1301 Woodside Building*
DETROIT, *2-257 General Motors Building*
ST. LOUIS, *1556 Bell Telephone Building*
SAN FRANCISCO, *883 Mission Street*
LOS ANGELES, *632 Chamber of Commerce Bldg.*
LONDON, *Aldwych House, Aldwych, London, W.C.2*

Published monthly, with one additional Convention Number during the year. $3 per year, 35 cents per copy. Entered as second-class matter, June 23, 1908, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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SEPTEMBER 15, 1931

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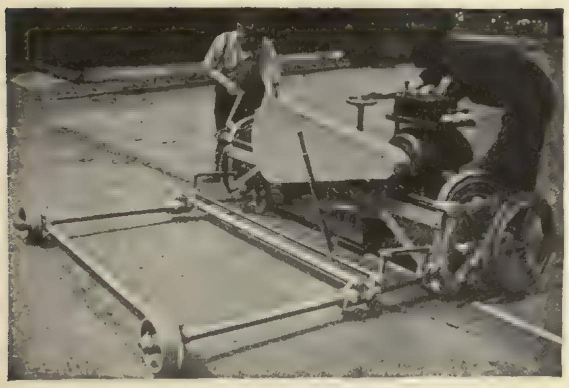
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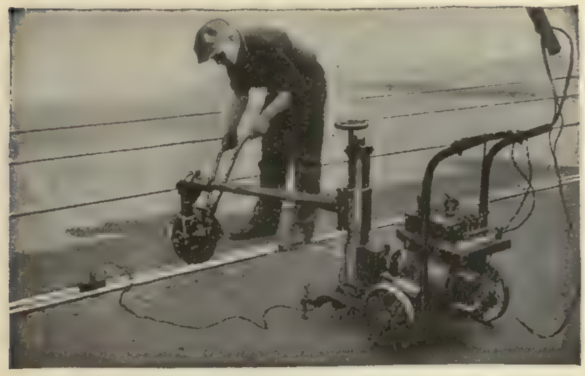
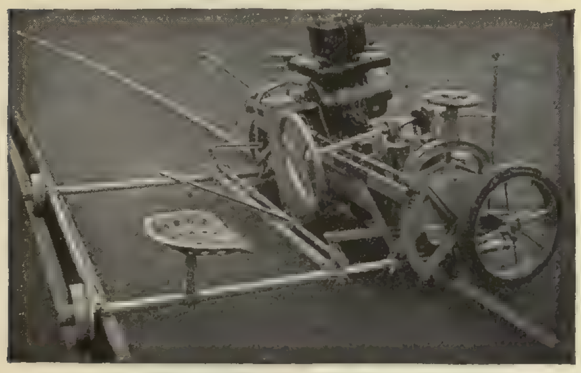
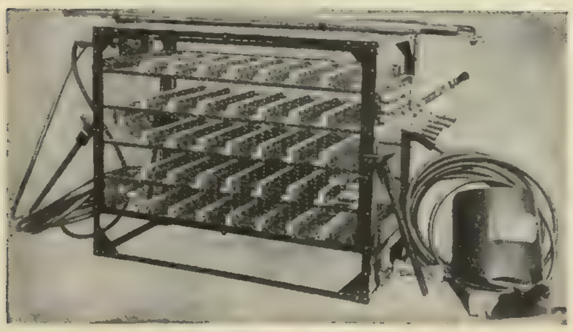

Eureka Radial Rail Grinder


Improved Atlas Rail Grinder


Ajax Electric Arc Welder

Tears or Sweat?

NOT much difference between them, chemically. But WHAT a difference financially!

Roads which are trying instead of crying have smoothed their track to progress.

There's no getting away from the fact that smooth track cuts maintenance costs, boosts business, speeds schedules, stifles noise.

And here is equipment that is relied on for economical track smoothing by most of the world's electric railways.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. La Salle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London
Railway & Welding Supply Company, Toronto, Ontario

1072

An Invitation

THE WESTINGHOUSE TRACTION BRAKE COMPANY
INVITES YOU TO VISIT ITS EXHIBIT AT THE
A. E. R. A. CONVENTION
ATLANTIC CITY, N. J.
SEPTEMBER TWENTY-SIXTH TO OCTOBER SECOND
SPACES E-569 AND E-570

THERE WILL BE NEW DEVICES OF INTEREST
TO EVERY STREET RAILWAY MAN
AMONG THEM BEING
SELF-LAPPING BRAKE VALVES AND THE TRACTION BOOSTER

WESTINGHOUSE
TRACTION BRAKE CO.
General Office and Works
Wilmerding, Pa.

50 Years Ago

> **"I believe this is the last convention that will seriously consider horses for operation of street cars."**
>
> ***James Lowry,***
> ***Buffalo, N. Y., 1890***

THE commendable spirit of cooperation within the electric railway industry has been responsible, in a large measure, for the success of many progressive practices witnessed during the past 50 years—from the horse car of yesterday to the trolley bus of today.

Much has been heard about the comparatively low operating cost of this latest method of auxiliary transportation to important street car routes. Equally favorable have been the reports of increased revenue. Therefore it is not to be unexpected if the trolley bus should have the lion's share of attention at the 1931 A.E.R.A. Convention.

As interested as one may be in the vehicle itself, it is only reasonable to remember that the success of the trolley bus lies, not alone in the silence of its motor nor in the smoothness of its speed, but that its success lies also in the careful planning of the overhead trolley system and the proper selection of current collection equipment and bus accessories. In the study of this important part of trolley bus operation, many men will meet in common understanding at the O-B Exhibit.

A large part of this exhibit will be given over to the display of the latest and most successful overhead and bus equipment devices now being used. You are cordially invited to visit this display and see at first hand, the present day solution to problems of overhead construction and vehicle operation—to help yourself generously of the information available and to suggest the findings of your own experience that the fund of knowledge will be increased for the collective profit of the entire industry.

Those whose paramount interest is in the economical operation of street cars, will find many new appliances covering line materials, car equipment, and rail bonds. The O-B booth will present various labor-and time-saving devices designed to reduce maintenance charges.

The O-B booth will occupy spaces E-502-503-504-505

TODAY

> "The value of the trolley bus will be widely recognized, and to many cities will prove of tremendous value in restoring public confidence, as well as providing an earning power to the operating company."
>
> *G. A. Richardson*
> *Vice President and Gen. Mgr.*
> *Chicago Surface Lines*

Trolley bus installations have been made recently in the following cities:

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Salt Lake City
Duluth
Kenosha
Detroit
Brooklyn
Shreveport
Peoria
Knoxville
Pawtucket
New Orleans
Memphis

O-B Swivel Trolley Shoe

A rugged but extremely light weight current collector for trolley bus service. The shoe rides the overhead smoothly with a miunimm of dewirements, and greatly reduces the annoyance of radio interference.

O-B Titon Bond

In some trolley bus installations, routed over the old tracks of retired street cars, the old rail is serving as the negative feeder. In these cases, O-B Rail Bonds have been used profitably to rebond the track and insure a good return.

Special Type ZCF Headlight

An automotive design particularly adaptable to the modern trolley bus. Construction is thoroughly dust proof. It is a recess-mounted headlight of extremely shallow design, and is furnished in either crystal or gold ray glass reflector, or chromium plated metal reflector.

O-B Featherweight Form 5 Base

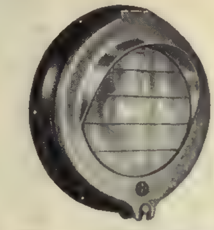
A six spring trolley base in which lightness of weight and sturdiness have been combined successfully. Weighs about 89 pounds. Movable parts are easily inspected or adjusted. Timkin roller bearing assembly on main bearing gives great freedom of easy movement. The base selected for use in majority of trolley bus installations of today.

O-B Tangent Hanger Assembly

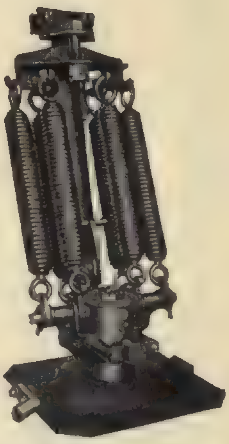
Consists of O-B Spring Lock Hanger for main insulation, a type B Hanger for secondary insulation, and a tapered Marathon Ear for supporting trolley wire. This method of suspension is in service on several trolley bus installations.

O-B Trolley Shoe

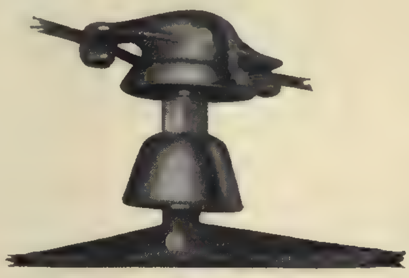
O-B Titon Bond



Type ZCF Headlight



O-B Featherweight Trolley Base



O-B Trolley Assembly

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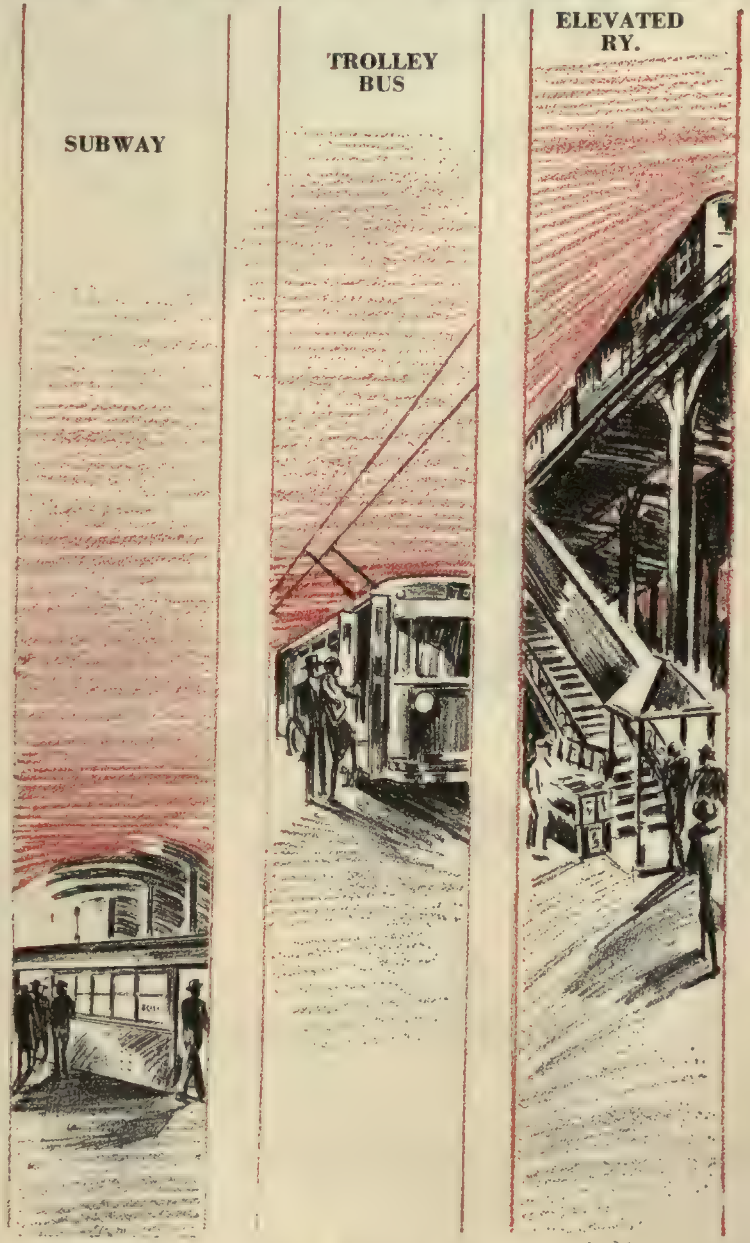

For every type of mass transportation, there is a system of N.P. Door Control which will provide faster, safer, more efficient operation at greatly reduced costs.

You cannot afford to overlook the definite advantages procurable with National Pneumatic equipment.

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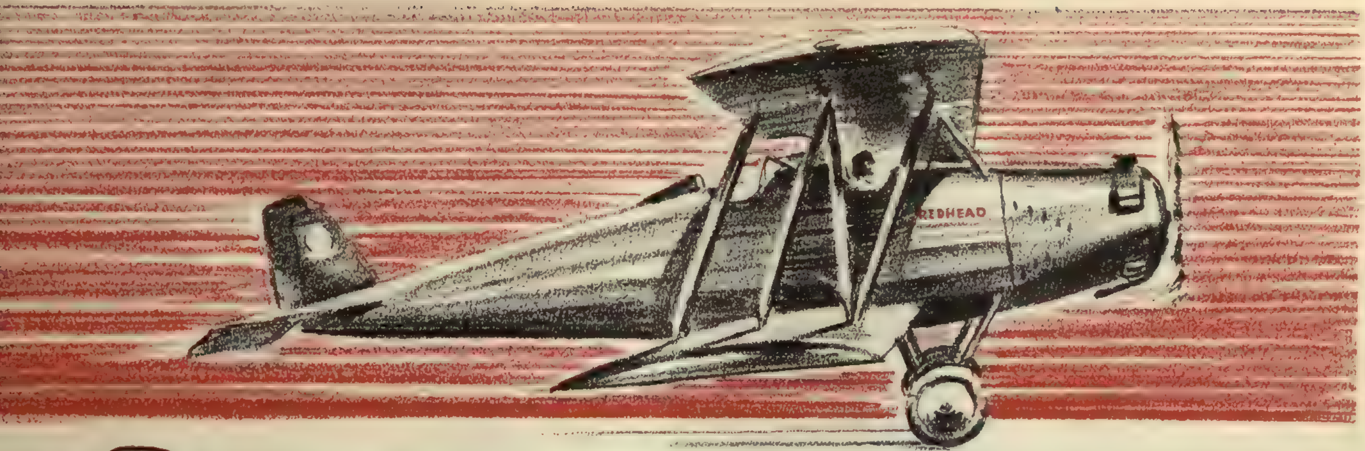

NP Door Control

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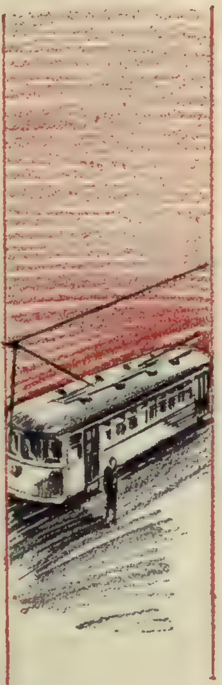
SURFACE TREADLE CAR



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The New York, Lake Erie & Western R. R. Has 228 Passenger Trains equipped with it, nd says there is no other system to are with the Pintsch.

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THE SAFETY CAR H

160 BROAD

50 Years! Years which have seen greater progress than any previous century in history! And yet, as we smile at the crude equipment and slow transportation of 50 years ago, we must applaud the early pioneers for their vision and persistence in laying the foundations for our modern industry.

This company takes pride in its constant effort to furnish the most modern accessories for the safe, fast vehicles of today's transportation program.

"GOOD OLD DAYS"

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Spaces 514, 516, 518, 520

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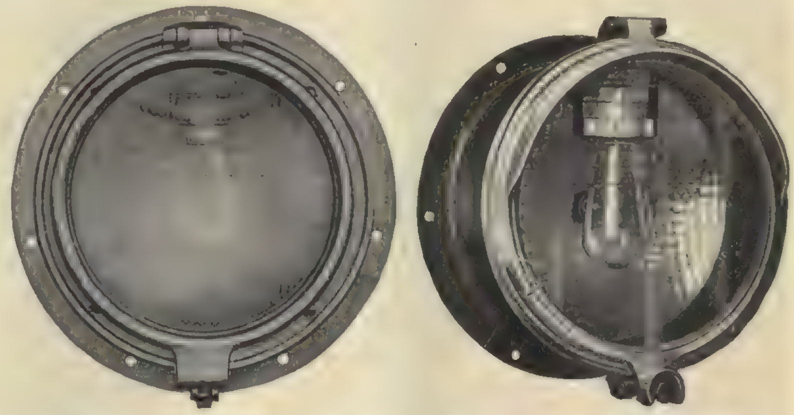
New Keystone Car Lighting Fixtures, combining sturdy, practical construction with the "looks" necessary for the finest cars. Many other types available.



The famous Golden Glow Headlights and Flood Headlights for buses, cars, and trolley buses. Efficient, powerful, controlled illumination. Several styles for various types of service.

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WHY TROLLEY BUS OPERATORS ARE ADOPTING "Phono"

See the display and learn all the catenary applications of "PHONO" Alloys, Booth 585, A.E.R.A. Convention, Sept. 26-Oct. 2, Atlantic City, N. J.

No longer is the trolley bus an experiment—its flexibility, speed, quietness and comfort have won the public. Operators have rapidly learned that it meets auto competition, requires no track maintenance and gives efficient service at low cost.

DEFINITE ELASTIC LIMIT 65%

But the trolley bus has its own peculiar problems. Due to side stresses caused by the wide touring range (over 15 feet) from the center of the overhead—the contact wires must be tough—high in tensile strength. "PHONO" answers that need, as a quarter of a century of service on the major electrifications in this country has proven. The contact wires must be strung tightly, and stay tight, to avoid dewirements and the possibility of positive and negative wires swinging together and burning down. "PHONO" (cadmium) wire has a definite elastic limit of 65% of its tensile strength—it can be depended on to maintain a predetermined tension, without the care and adjustment necessary with copper.

WE RECOMMEND "Phono

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"Phono" (CADMIUM) WITH 85% MINIMUM CONDUCTIVITY MEANS HIGHER EFFICIENCY ON TRACKLESS SYSTEMS . .

Note the off-center operation in the accompanying photograph and remember the contact wire guides your trolley wheel or shoe in trolley bus operation, *not* the car body as in the case of trolley car operation. With "PHONO" contact wire, the real benefit of high definite elastic limit is realized for the above purpose.

With its long, trouble-free service, "PHONO" (cadmium) is also high in conductivity with operating averages equal or superior to copper. This is important in reducing the need for auxiliary feeders. When considering the overhead, it will pay to get the facts from Bridgeport engineers. Let their experience help you.

"Phono" FOR DURABLE SPAN WIRES

Reliable, durable span wires are as necessary as contact efficiency. There are more wear and fewer replacements with "PHONO" (standard) or "PHONO" (cadmium) spans than galvanized wires. "PHONO" will pay for itself while the installation is still "new," not only in wire, but in bolts, clamps and other outdoor accessories where ruggedness and corrosion-resistance are essential. Ask Bridgeport for full information.

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Alloys" FOR TROLLEY BUS OPERATION

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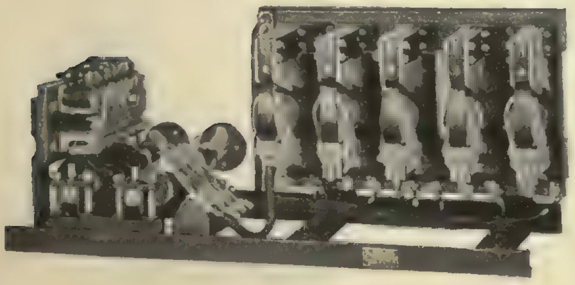
For Single-Motored 30-Passenger Trolley Buses

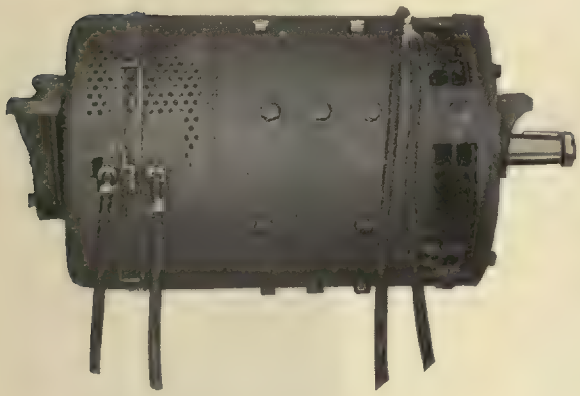
NEW

LIGHT-WEIGHT LOW-COST EQUIPMENTS



Type M group with master controller, reverser, and contactors

THE remarkably light weight and low cost of this G-E equipment for single-motored, 30-passenger trolley buses are made possible through a recent development of Type M control for under-bus mounting — used in combination with a GE-1154 (50-hp.) light-weight motor. This Type M group is extremely simple, compact, and reliable; it is foot-operated and nonautomatic. It meets any requirement of the service and weighs, complete with master controller, contactors, and reverser, only 125 pounds.



GE-1154, 50-hp. motor

The low first cost of this equipment and the present low price of copper for overhead construction offer an immediate opportunity to obtain all the operating economies of trolley-bus installations — with an investment very little higher than is required for gas buses.

Let us analyze your service conditions with you. For complete details and quotations, address your nearest G-E office, or General Electric Company, Schenectady, New York.

30-PASSENGER trolley-bus equipment includes a GE-1154, 50-hp. motor (785 lb.), two current collectors (300 lb.), and complete control, including the Type M group, line breaker, EW resistors, cable, etc. (271 lb.). Total weight, 1356 lb.

EQUIPMENT for smaller trolley buses is also available. It includes a GE-1126, 35-hp. motor (500 lb.), two current collectors (300 lb.), and complete control, including Type M group, line breaker, EW resistors, cable, etc. (271 lb.). Total weight, 1074 lb.

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TRANSPORTATION EQUIPMENT

ELECTRIC RAILWAY JOURNAL
Volume 75
Number 10

Consolidation of Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, *Editor*
New York,
September 15, 1931

Building on the Experience of

A Half Century of Progress

Foreword by
JAMES H. McGRAW

COMMUNITY TRANSPORTATION in America is still a comparatively young industry. Less than 50 years have elapsed since the first practical application of electricity as a motive power for street cars. Some of the men prominent in the electric railway industry today have been actively associated with it since its birth. Over its problems they have worked and worried, argued and amplified, planned and perfected. Its progress and improvement have been their first concern, and they have good reason to be proud of their accomplishments.

From modest beginnings the business of community transportation has grown to be one of the great industries of the country. Not only has it increased in size but it has also broadened tremendously in scope. Fifty years ago community transportation and street railway service were synonymous. Today the street car is still a vital element in urban transportation, but it is not the only element. On the one hand it has been supplemented by rapid transit lines and electrified suburban railroad lines, and on the other by the motor bus and the trolley bus. For individual service it has been supplemented also by the taxicab. Slowly but surely the services of these different elements are being co-ordinated. The street railway operator of yesterday has become the transportation merchant of today.

New types of rapid and comfortable transportation service, undreamed of a half century ago, have been developed. These developments in turn have been responsible for a great change in the distribution of population. Even more significant, perhaps, is the change that has taken place in the travel habits of the people. Once they were accustomed to live and move within a comparatively small orbit. Now the situation is vastly different. We have become a fast-moving travel-loving nation. We like to go places, and not waste any time about it. We have become thoroughly transportation conscious, with a well-developed sense of travel discrimination.

Our cities are expanding and their populations are increasing at an accelerating rate. People are using more transportation today than at any previous time in the history of the world. Public transportation service must keep pace with these developments. We must meet the constant demand for new facilities. But we must do more than that. We must furnish the kind of transportation the public wants. People today have no more liking for old-fashioned styles in transportation than they have for old-fashioned styles in clothes. If the history of this industry shows any one thing more clearly than others, it is the inevitability of change.

Modern demands can be met only with modern standards of service. Whether the vehicle be an electric rail car, a gasoline motor bus, a trolley bus or a taxicab, its design and operation must be attuned to the times. Interest is now focused on this subject to a greater extent than ever before. The problems presented are complex and difficult, but not more so than those which the industry has solved successfully time after time. When the history of transportation during the next 50 years is written, it will record new names and new achievements worthy to stand beside the famous names and great achievements of the past half century.

WHERE once the horse or mule car wended its almost solitary way carrying occasional passengers, the modern electric car now carries vast multitudes intent upon speed despite congestion undreamed of in an earlier day

By
JOHN H. HANNA
President
American Electric Railway Association

President
Capital Traction Company
Washington, D. C.

The picturesque horse-drawn omnibus on Broadway, New York, a century ago—the forerunner of our modern transportation vehicles

Evolution of Community Transportation

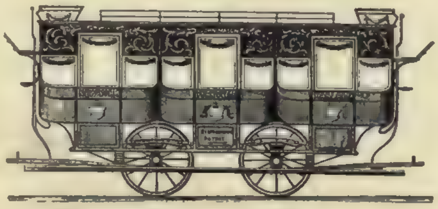
MASS TRANSPORTATION in the cities of this country was by no means an infant 50 years ago. It was already 50 years old, and was an industry of considerable importance. Nearly 400 years before some inventor had discovered that wheeled vehicles would move more readily and easily if a track of some sort was provided for them, but this discovery did not bring about the extensive use of rails until the development of the steam railroad.

Horse-drawn vehicles carrying both freight and passengers were used on Fourth Avenue in New York in 1832, and even before that freight had been moved by this means, but in a desultory fashion. While the growth of the horse street railway was rapid throughout the '50s and '60s, there was no attempt at a co-ordinated system which would care for the entire needs of the community. Every large city in this country and many of the smaller ones had one or more street railway systems meeting their transportation requirements. These roads were managed by men who, judging from their records of achievement and public utterances, were well up to the high standard of ability which we believe our industry enjoys today.

Fifty years ago there were 415 such companies, operating 18,000 cars over 3,000 miles of track, and utilizing the services of more than 100,000 horses. They carried nearly 1,250,000,000 passengers per year, and had a combined capitalization of $150,000,000.

The place which the street car occupied in the cities of that time is described in the following words of the Honorable Moody Merrill, of Boston, at the opening meeting of the first convention of street railway men, which was held in Boston on Dec. 12, 1882: "Cars can now be seen going to and from the places of amusement filled with ladies robed in silks, velvets and ermines and adorned with costly emeralds, rubies and diamonds."

That the men of 50 years ago who carried the responsibility of urban transportation were progressive and alive to their responsibilities is best shown by the encouragement and support given to the early developers of electric traction, and the rapidity with which that system was adopted after its feasibility had been established. Prior to that time, particularly in the '70s and early '80s, great improvements in horse car service had been accomplished. Frequency of service was increased, and the later cars, with their highly decorated exteriors, contained added conveniences for patrons, showing a realization of the need of public approval. This point of view was expressed in many spoken and written utterances of the day.



America's first street car, the "John Mason," placed in service on the New York & Harlem Railroad in 1832

The first decade of the past 50 years was the period of experimentation in electric propulsion. A Vermont blacksmith, Thomas Davenport, apparently was the first to conceive the possibility of using electricity for moving a vehicle. He built and exhibited a small electric motor car in 1835. Later experiments by Professor Farmer, of Newport; Professor Page, of the Smithsonian Institute, and others made further progress. Professor Page, in 1851, was able to propel a small car over 5 miles of track near Washington at the unheard of speed of 19 m.p.h. His des-

For many years the animal-drawn street car reigned supreme

One of the early experiments in electric operation utilizing an overhead "troller" carriage—progenitor of the trolley

tination was the famous dueling grounds at Bladensburg, which may have been significant, as his primary batteries, his only source of power, were entirely destroyed when he got there. All of these experiments were doomed to failure until the development of the power-driven dynamo, and the discovery that the dynamo would function as a motor when current was applied to it.

Edison's Menlo Park car in 1880 and Van Depoele's at the Toronto Industrial Exposition in 1884, with other early and valuable work by John C. Henry, Leo Daft, Professor Short and others, all culminated in the first large commercial electric railway, built by Frank J. Sprague in Richmond in 1888. Without in any way discounting the importance of earlier experiments, it was Mr. Sprague's success in Richmond that was the foundation stone of the electric railway.

In the meantime, while awaiting the development of a suitable electric system, many other means of substituting mechanical for horse power were tried. The most important of these was, of course, the cable road, such as had been used for years in mines, and which was first developed for passenger transportation in San Francisco in 1873. The cable system was extremely costly to install and operate, but furnished a reliable, convenient means of transportation. While slow, as measured by modern standards, cable car speeds of 10 to 12 m.p.h. were twice as fast as those attained with animal power, and cable lines furnished the backbone of city transportation for a number of years in many of the larger cities. The cable system was a wonderful engineering development; its acceptance and widespread adoption were further evidence of the courage and progressiveness of the early leaders.

Numerous other means of propelling public vehicles were tried during this period but were found wanting. Steam locomotives, while giving acceptable service on elevated lines, were found unsuitable for obvious reasons on city streets. Storage battery cars were strongly urged, but failed to give satisfaction because of added weight, the time necessary for recharging the batteries, and their short life. Compressed air cars were operated from storage tanks and attempts were made to use pipe lines along the track. Both methods were short lived. Various forms of chemical motors using caustic soda or ammonia gas appeared and rapidly disappeared in the frenzied search for a substitute for the horse and mule, but the many advantages of the electric motor, fed by current generated at central stations, soon drove all other competitors from the street car field, except in such unusual conditions as the steep hills of San Francisco where cable cars still run.

After Sprague's success in Richmond, the growth of overhead trolley lines was marvelously fast. The Richmond operation began in February, 1888, and before the end of that year about 25 other roads in all parts of the country were using electric propulsion, not as an experiment, but as a permanent basis of their transportation systems. As many more were under contract.

Successful use of electricity resulted not only in the rapid elimination of horse and cable lines, but also in a sharp growth in total street car mileage. In 1887, just before the opening of the Richmond system, there were only 29 miles of electric road in the country, 357 miles of cable lines, and approximately 5,000 miles of horse car lines. Ten years later the electric mileage was 13,765. Cable roads, which had reached their peak in 1893, had been reduced to 539 miles, and only 947 miles of horse car lines were left. Another decade increased the electric mileage to more than 34,000, and left only 62 miles of cable and 136 miles of horse-car lines. Much of this horse-car mileage was in New York, which operated the first horse car in 1832, and the last one, which clattered and jingled on its final trip in 1917.

The year 1890 found the electric system definitely established as a practical means of furnishing street car service, and growing with astonishing rapidity. The total investment in the industry had increased to nearly $500,000,000—more than three times that of ten years before. Similar increases, though not quite to the same extent, were shown in the length of line, number of cars and passengers.

The "Gay Nineties" represents perhaps the most important decade in the history of electric transportation. It was marked principally by engineering developments and improvements in the electric system, the utility of which had been established in the previous decade. In 1890, 500-volt standard pressure was adopted on practically all systems. It was found that equipping the old horse cars with motors did not meet the needs, and double-truck cars 30 to 40 ft. long were introduced in St. Louis and Boston. It marked the beginning of the vast number of improvements in rolling stock which have since continued uninterrupted.

The first street car motors had been placed inside the car or on the platform, belted to the car axle. These soon were replaced by motors supported on the axle. At first a single gear reduction was used, but with the light motors had to be replaced with double-reduction gears. Single-reduction motors returned in 1890, and were soon adopted

On some of the early installations small electric locomotives were used to draw the passenger cars generally. The first motors were open, but these were soon superseded by so-called waterproof motors with tight cast-iron casings. Today's tendency toward the use of ventilated motors and high-speed armatures with a multiplicity of gears or worm drive is an interesting throwback to the early design.

Track construction, too, was radically changed. Heavier rails were found necessary. The opposition of municipal governments to the use of T-rails brought about the girder rail design, and the many inventions of improved rail joints naturally followed.

Thomas A. Edison and a group of friends riding on his experimental electric railway line at Menlo Park in 1880

This period was marked by many consolidations of both operating and manufacturing companies. The first holding company, McKee Syndicate, composed of New York, Pittsburgh and Philadelphia bankers, acquired numerous properties, and the general tendency was for the co-ordination of the many railway companies of each city into a single system. In the '80s numerous manufacturing companies were in active competition for the street railway business. But consolidations were soon in order. In 1890 the Edison General Electric Company, formed by a merger of the various companies carrying Mr. Edison's name, combined with the Sprague Electric Railway & Motor Company. In the meantime, the Thomson-Houston Company, of Boston, had acquired the patents and interests of Messrs. Daft, Van Depoele, Bentley and Knight. These two large companies were in keen competition, in which they were joined in the same year by the entrance of the Westinghouse Company into the traction field.

In 1892 the Thomson-Houston Company the the Edison Company consolidated, establishing the General Electric Company, which, with the Westinghouse Company, has dominated the business since. These two great companies, through their progressive policies and their scientific research, have made possible the tremendous growth of electric traction.

Invention of the three-phase system of power transmission, first made applicable to railway work in 1894, tremendously broadened the scope of electric railway development. Prior to that, the limitation of 600-volt d.c. transmission limited the use of electric cars to comparatively short lines. The possibility of transmitting large amounts of electric power economically over long distances completely changed this situation. It marked the beginning of the interurbans which played such an important part in the development of the country, and which made possible the spread of population from the congested districts of the cities to the suburban areas.

The same period saw an elevated electric railroad at the Chicago World's Fair and the beginning of electric operation on the elevated roads in Chicago, both of which were of far-reaching importance. The latter was the forerunner of rapid transit systems, without which the larger cities in this country or abroad could not exist. The year 1895 also saw the first permanently successful conduit electric system developed, by Albert N. Connett, on the Metropolitan Railroad's lines in Washington. Other forms of conduit systems had been tried in Washington and European cities but had not been satisfactory. Mr. Connett's work made it possible for the cities of Washington and New York, where the overhead trolley wire was banned, to take care of their transportation needs by a more satisfactory plan than by cable or horse power.

The first practical use of electricity for steam railroads was made in 1895, when the Baltimore & Ohio Railroad placed its electric locomotives in tunnel service at Baltimore, and the New Haven Railroad equipped its Nantasket Beach line for electric operation. The B. & O. locomotives were a remarkable engineering achievement, and continued to furnish satisfactory service for many years. The advantages to passengers of the elimination of smoke and cinders in terminal tunnels were clearly shown by this undertaking and resulted in the adoption of similar systems in New York and elsewhere.

Consolidations continued to take place; the Boston Elevated leased for a long term the West End Street Railway, one of the largest systems in existence; the elevated lines in New York were electrified; and in January, 1900, the first contract was let for a rapid transit subway system in New York.

The end of the century found the industry well stabilized financially, and, from an engineering point of view, with a total track mileage in excess of 20,000, of which 95 per cent was electric. The investment had grown to nearly $2,000,000,000, and the railways were carrying 4,500,000,000 passengers annually in 62,900 cars.

The early years of the century were marked even more than the previous period by consolidations of operating companies throughout the country, and by the electrification of the Pennsylvania Railroad and the New York Central lines entering New York City.

About the beginning of the twentieth century, a development took place which was to have a marked effect not only on street railways, but on all forms of transportation. Horseless vehicles had been talked about for years, but when the first crude automobiles began to appear on the streets, few people even dreamed of the important effect they would have on our future social life. Street car managers who had been worried temporarily by the bicycle craze of the early '90s thought, if they gave any serious consideration to the matter, that this was merely another passing fancy. The bicycle was responsible for the invention and development of the pneumatic

Steam dummies and passenger trail cars held an important place in the industry for some years

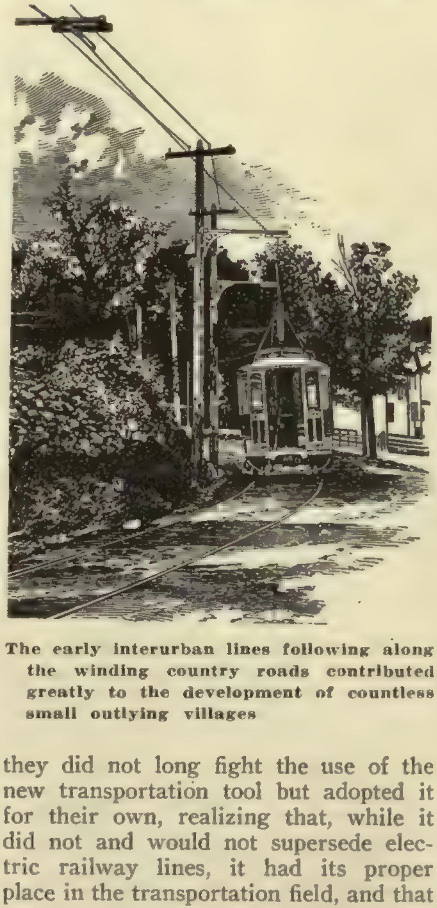
rubber tire, and it was this invention, coupled with the improvement of the internal combustion engine, which made possible the tremendous growth in the use of motor vehicles and which entirely changed the aspect of the transportation business both in and out of cities.

By 1910 automobiles had become a common sight on city streets and country roads. Their influence was beginning to be felt by public carriers of passengers. Before that time no surburban developments were thought of unless they were accompanied or preceded by the building of a trolley line. The new vehicles had not yet affected, however, the continued growth of electric railways both city and interurban. Electric railway mileage in 1912 was 40,808, nearly double that of ten years previous, the number of passengers was in excess of 9,500,000,000 and the capitalization more than $4,500,000,000, both more than doubled in ten years.

Managers were finding out, however, that there was a limit to the amount of money to be made. Except for the severe business depression of 1893, the street railway business had been uniformly growing, not only in size but in financial strength. It was the aristocrat of the utilities; its securities were in demand and selling at good prices. About this time, though, managers began to discover that this font of gold was not unlimited. The continued extension of service given at the same rate of fare; growing burdens in taxation imposed by municipalities and by demagogical politicians who delighted then, as they do now, in opening their guns at the first sign of prosperity, together with increasing cost of labor, began to affect net earnings so that capital was not as friendly as it had been.

The rapid growth of the automobile industry and particularly the development of cheap reliable cars selling for under $1,000 naturally had made some inroads on mass transportation, but it was only with the appearance of the so-called jitney between 1915 and 1920 that the industry first realized just how serious automobile competition could be. Jitneys, second-hand automobiles operated by private individuals at a 5-cent fare, blazed forth like wild fire, starting on the Pacific Coast and spreading over the whole country. Arguments that this form of transportation could not economically continue to exist and that permitting jitneys to run constituted a direct violation of franchise agreements under which street railways were operating did not prevent the serious inroads which they made for several years. Their life was relatively short and few operate today, but they left a scar on many previously prosperous companies. In 1920, thousands of them were still running, although fundamental economics and regulatory restrictions were beginning to put them out of business.

The jitneys were quickly followed by buses, which at first were nothing more than large automobiles operating under the same circumstances as the jitney but carrying more passengers. The introduction of the bus was fought at first by many railways as strenuously as had been the jitney, but before long it became evident that here was a real transportation tool, and that the trouble was not in the vehicle but the way it was used. The old warfare between rail vehicles and those running freely on highways which had been fought out about the middle of the last century was begun again but under different conditions. Rubber tires and good roads changed the situation and made the fight take on quite a different aspect. Electric railway managers, like their predecessors of 30 years before, were wise; they did not long fight the use of the new transportation tool but adopted it for their own, realizing that, while it did not and would not supersede electric railway lines, it had its proper place in the transportation field, and that place would best be filled if all forms of urban passenger transportation were coordinated in one operating unit.


The early interurban lines following along the winding country roads contributed greatly to the development of countless small outlying villages

When this country entered the World War in 1917, the street railway industry included 44,800 miles of track—a growth of 30 per cent in ten years. Approximately 80,000 cars, with 295,000 employees were carrying 11,305,000,000 passengers per year, and a total capitalization of $5,136,000,000 was reached.

The War, of course, brought many changes, affecting no industry in this country more seriously than the electric railways. Practically doubled costs of both labor and material were not and could not be completely compensated for by increased fares. More track and more cars were needed to serve the many wartime industries which grew like mushrooms, particularly on the Eastern seaboard. Lessened earnings weakened the financial standing of the industry, and, in many instances these necessary improvements were made with funds borrowed from the Federal Government. There were many receiverships, but the majority of the established systems in larger cities were able to weather the storm successfully. The 5-cent fare, with or without reduced-rate tickets, had been in existence for generations, and there was a great disinclination on the part of the public and regulatory bodies to change it, in spite of the fact that there were few other things which a nickel would buy.

The gravity of the situation and the menace which it offered to municipalities influenced President Wilson, at the suggestion of the Secretaries of Commerce and Labor, to appoint a Federal Electric Railway Commission to investigate the whole matter carefully and report recommendations. Public hearings were held and thousands of pages of testimony were taken, after which the commission made a unanimous report. They found that the industry as a whole was in a serious financial situation and not properly functioning; that in order to remedy this condition economies in operation and improvements of service should be instituted; that financial structures, where necessary, should be adjusted to meet actual values; that unfair assessments, such as paving construction and maintenance of bridges, should be eliminated; that rigid regulatory control by municipal or State governments should be continued; but that this should be flexible in character and provide sufficient revenues to encourage the influx of capital. They particularly urged a prompt and reasonable settlement of franchise problems. This investigation and report had a beneficial effect on the industry as a whole. Generally speaking, its recommendations were followed by the companies and in many instances by regulatory bodies. The result was a reduction in the number of receiverships and a general improvement throughout the industry.

The story of the past ten years is well known. Fares were usually but not universally increased; one-man cars, first developed for smaller cities during wartime difficulties, were found entirely suitable, if properly designed, for large city systems; financial reorganizations, when called for, took place, and many operating economies were effected; and the bus was adopted for supplementing rail operation, or supplanting it in a few instances where traffic was light. These changes brought improvements in the earnings and financial condition of the companies, in spite of the exceedingly rapid increase in automobiles, and the sudden springing up of thousands of cheap, flat-rate taxicabs, operating at low, competitive rates frequently under inadequate regulation.

The present depression found the industry still feeling the effects of the difficulties oppressing it during and following the war and though improving its position gradually but surely, this business has been affected as have all others. Unemployment has severely reduced the number of passengers and the amount of freight handled, with their attending revenues, without much chance of compensating savings in expense. Although some reduction in material prices has taken place, wages of electric railway and bus operators have remained unchanged. The industry's losses have not been as severe as those of many others, and there is every reason to hope that a return to normal business conditions will be accompanied by the satisfactory recovery and stabilization of urban transportation systems.

Any history of city transportation would be incomplete without reference to two of the most important and vital factors affecting it, that is—franchises and fares. In the earliest horse-car days, municipalities welcomed the advent of a more convenient and rapid means of transportation and encouraged its promoters. As soon as the business was found to be profitable, restrictions began to be placed on franchises, maximum fares were established, and the practice was begun of using public carriers as tax collectors by assessing against them many burdens not related to their business. The greater number of franchises were for a limited period of years; fares were fixed at 5 cents, independent of the length of the ride, with tickets at reduced rates in many instances. This arrangement was satisfactory as long as the operating companies were small and their lines short, but it became obsolete when the introduction of electricity led to extension of service beyond the original city limits. When franchises began to expire or when extensions of them were needed, the subject became a much more important one, and many conflicts arose in its settlement. As cities grew, capital in great quantities was required for extending their transportation facilities. This capital was not available unless some assurance was given that it would be safeguarded and paid for. Municipalities demanded lower fares or a share in the profits.

One of the first serious attempts to stabilize the situation was the adoption of the so-called service-at-cost plan in Cleveland in 1910. This plan provided for close regulation by the municipality of all details of service and expense. It established machinery whereby fares would be automatically lowered or raised to meet the actual cost of furnishing the service, including allowances for maintenance, operation and renewals, and a return of 6 per cent on an agreed value of the property, a value materially less than the outstanding capital obligation. It permitted purchase of the property by the city at any time on six months' notice, and laid down the terms under which purchase might be made. This experiment was satisfactory; it resulted in a much improved service to the citizens of Cleveland, and a lower rate of fare until war costs changed conditions. The franchise was extended in 1919 for another 25-year period. After a few years, modifications of the Cleveland plan were established in many other cities of the country, and, while not always entirely satisfactory, the service-at-cost theory presents probably the most satisfactory solution of the franchise problem.

One of the early cars used at Richmond. The success of this installation in 1888 gave great impetus to the electrification of street railways

Among other means of obtaining relief from the difficulties arising from increased costs during and following the World War were studies and experiments in changing the fare structure. All street railways had been operating since their inception on the simplest form of fare structure—the same fare for all service and all lengths of line—although fares varying in proportion to the length of ride had been the rule in other countries. Zone-fare schemes were tried in numerous instances during and after the war, but were generally unsuccessful because of their unpopularity. Suburban communities had been built up on the basis of the flat rate and objected strenuously to having this arrangement disturbed. Weekly and Sunday passes have been tried with varying success, and now are becoming increasingly popular.

Schemes of the same nature intending to encourage the use of public transportation vehicles had been tried even in the '70's and '80's. In Reading, annual tickets were sold, first at $12 and later at $15 and $25. Monthly tickets from $1 to $1.50, limited to certain hours of work days, were tried, as were other forms of cheap commutation tickets. The most interesting experiment was the sale of life tickets at $300 each and $500 bonds with interest payable in tickets to obtain sufficient money to build an extension of the horse car line. This experiment was probably the first instance of the modern practice of customer ownership.

Reference has been made to the adoption of the gasoline bus as a transportation facility. While the fight between highway and rail transportation about the middle of the nineteenth century resulted in a decided victory for rails,

The Metropolitan Elevated in Chicago was the first rapid transit line to adopt electricity. Its advantages were quickly demonstrated and other lines were converted to electric operation

public transportation by horse-drawn vehicles over city streets continued in a number of instances.

Probably the most notable example of long continued use of buses is on Fifth Avenue in New York City. The laying of rails on this famous thoroughfare had been prohibited when early horse car lines were built on Manhattan Island, but the need for some form of public transportation resulted in the operation of horse-drawn stages by the Fifth Avenue Transportation Company in 1885. Experiments with gasoline and gas-electric vehicles were begun a few years later but the first successful operation of motorized buses on Fifth Avenue did not come until 1907 when a number of French chassis with American-made bodies were put in service. The early work of this company had much to do with the development of the motor bus now so extensively used.

The general use of buses by electric railways began about 1920. In that year there were 21 companies operating 110 buses over 35 miles of route. This practice grew rapidly, and five years later 250 companies were operating 4,441 buses over 12,000 miles of route. At the beginning of 1931 there were 390 electric railways operating 13,522 vehicles on 26,099 miles of route. Widely spread statements that buses are rapidly supplanting electric roads is controverted by the fact that only 67 companies, operating an average of 5½ buses each have abandoned all rail operations and substituted buses. Street railway companies now are generally such in name only. The companies and men responsible for furnishing passenger transportation in our cities have assumed the responsibility of giving that service in whatever form the public may desire.

Not only has the gasoline bus been adopted, but in recent years great strides have been made in the use of the trolley bus. This vehicle was tried experimentally many years ago, but only within the past three years have vehicles been perfected which are giving satisfactory service. The first company to make extensive use of the modern trolley bus was the Utah Light & Traction Company, Salt Lake City, which, beginning in 1928, has put a total of 26 in service. The largest trolley bus system in the country today is operated by the Chicago Surface Lines, using 114 vehicles. The trolley bus will undoubtedly take a very prominent place in the transportation systems of the future as it offers, for a certain character of service, many advantages over either trolley car or gasoline bus.

The industry has not confined itself to the use of mass transportation vehicles, but also has adopted the taxicab in numerous instances for supplementing other facilities. The operation of taxicabs by an organized company cannot be successful unless this service is subject to the same sort of regulation applied to the mass vehicle, but the ideal solution of the urban transportation problem undoubtedly lies in the unified control of all forms of public transportation in each community with responsible management and under strict regulatory control.

The problems confronting mass transportation as an industry today are many and at times seem almost insurmountable. The usefulness of reviewing failures and successes of past years may be questioned. Conditions change; methods and practices must change with them; but the fundamental policy of giving to the public upon whom we depend for our existence the best available form of service at the lowest reasonable price has remained unshaken throughout the industry's long and interesting history.

Urban life increasingly requires the movement of persons within and without the city's boundaries. This movement can never be accomplished solely by means of individual vehicles. Mass transportation facilities are required and always will be, and there is no reason to doubt that the successors of the long line of men who have notably carried on this important business in the past will be equally as successful in the future. To do so satisfactorily, they must be helped and not hindered. This is a public and not a private business, but it is contrary to the spirit of this country that the Government itself undertake the operation of any business which can be successfully carried on by private capital and under private management.

On the part of the public, franchise questions must be settled in a manner fair to all concerned but must be settled positively. Inequitable burdens in the form of special taxes must be removed and the co-operation of regulatory authorities given to managements in their efforts to improve their financial condition and the service which they render. On the part of the managements the realization that this is a changing age and that the public desires something different and better than what it has had in the past must be recognized. Important studies are now in progress for the development of a vehicle which will better meet the public needs, of the important fare question, and of many other operating problems. The industry has met serious situations throughout its history, and will unquestionably succeed in overcoming its present difficulties.

Washington, D. C., in the early nineties, showing the underground conduit system, which is still used there and also in New York City

Looking Ahead

in Urban Transportation

By

G. A. RICHARDSON

First Vice-President
American Electric Railway Association

Vice-President and General Manager
Chicago Surface Lines

Public transportation facilities are absolutely essential to the occupants of buildings such as this. If they had to depend upon private automobiles another structure of equal size would be required for garaging

The tremendous increase in the number of private automobiles has overtaxed the capacity of existing streets and hindered the movement of mass transportation vehicles

FOR twenty years — ever since the automobile began to assume importance in urban traffic—the electric railway industry has been struggling through various stages of readjustment. There have been times when the leaders of the industry have been inclined to waver in their faith in the future and when the conviction was strong in the public mind that electric railways were obsolete, or at least obsolescent. The industry has successfully survived the "wild cat" jitneys and the clamor which hailed the motor bus as the modern cure-all for local transportation ills. It has weathered the storm of increasing costs of operation and necessary fare adjustment, and it is finding new means of meeting competition which caters to the public's desire for comfort and speed. Now the time seems to have arrived when it is possible to evaluate the various elements which are involved in urban transportation, and to plan for the future with a considerable degree of confidence. We now know the limitations of automotive traffic, and we are at least beginning to understand the transportation needs of the modern city.

The automobile has encouraged people to move about as never before. Habits, customs, forms of entertainment, and the whole scheme of city life have been drastically altered. The new restlessness and roaming spirit have been developed by the freedom possible with widespread use of automobiles for the amusement period of the day. Of course, the family car, or one of them, is also put to work on slight excuse as a carrier to and from work. The sense of luxury or of personal prestige derived from the use of an automobile appeals to many, and certainly has caused a decrease in the street railway riding from what otherwise would have resulted from the growth of population. Yet, when compared with the tremendous increase in automobile passenger-miles and registration, the constancy of the street car ride curve is truly remarkable. The automobile has unquestionably affected travel on the established local transportation agencies, but not to the extent that is popularly believed. Passenger automobiles in the United States in 1929 were operated a total of approximately 300,000,000,000 passenger-miles — many times more than the total for all other land transportation facilities—but the greater part of this represented riding which would not have existed if there had been no private automobiles. It was stimulated by the new vehicle, in conjunction with the normal development of the country, advancing standards of living and better highways.

Since 1921 motor vehicle registration in the United States has increased from 10,464,000 to approximately 27,000,000. In this same ten-year period, the business of electric railways for the whole country has shown no increase, but neither has it shown a decrease. Total passengers of electric railways of the United States in 1921 numbered 14,593,234,000. In 1930 they were 14,600,000,000. It is evident, therefore, that the loss of patronage by electric railways due to increasing automobile ownership is not as great as some people would have us believe.

The streets are congested by parked vehicles, and vehicles cruising to find parking space or left standing out in the second lane in sheer desperation. Movement is becoming slower, driving is more annoying and the air isn't so pleasant to breathe. New streets have been built and old ones widened, but the costs are now beginning to hurt, and the cities' bonding limitations aren't so far away. The crest of the wave is passing because the surge has overwhelmed the facilities to the point where costs and difficulties must be reckoned. The terminal conditions are becoming strained, and yet only a small proportion of the people are being served.

Modern large-capacity car with doors at front, center and rear is an efficient vehicle for handling mass transportation

In Detroit only 26.6 per cent of the people, except pedestrians, moving outbound from the central business district in the evening rush hour go by taxicab and private automobile. In Philadelphia it is 18.1 per cent, in St. Louis 21.0 per cent, and in Chicago 11.1 per cent.

As pointed out in the report of the Rapid Transit Commission of the City of Detroit for 1930, the density of traffic is increasing at a greater rate than the increase in automobile registrations, and it is clear that traffic in the central business district of some large cities is approaching the point of saturation. Under present conditions of city development it would be impossible to carry by private automobiles all of the rush-hour riders, even if all of them had automobiles.

Garages cannot be provided to house the cars that would be needed. It takes almost exactly the same floor space per person served to house the automobile as is needed for him in office space. That would mean one twenty-story garage building for each twenty-story office building. Imagine half the ground space used for garages and, therefore, double the rent cost of doing business! Already the streets in the apartment neighborhoods are becoming choked with cars that are stored on the streets all night. Some day these must be cleared not only to restore freedom of movement on the street, but because of the very tragic results that may come from a fire that the firemen cannot reach due to the parked cars. Terminal conditions at both ends of the route are about to control the extravagant use of the automobile. Consequently, the automobile as a factor in local transportation becomes less important as the size of the city increases.

In spite of all the handicaps of operation and difficulties of financing additional equipment, the rapid transit lines of New York have shown steadily increasing patronage. From the year 1923 to 1930 the number of passengers on the Interborough Subway system increased by 42 per cent. On the Brooklyn-Manhattan system the number increased approximately 39 per cent. In Chicago the number of passengers carried by the combined public carriers increased constantly each year up to 1930, when the business depression began affecting traffic. Careful checks of the persons within the central business district of Chicago made in 1926, 1928, and 1929, show that, of those in the district at one time, not more than 7 per cent arrived by means of automobiles.

The automobile cannot assume the burden of local transportation, and it remains for the electric railway industry to continue to carry it. Fortunately, the experience of the past few years and the advancement made in process of development point the way toward success in this effort.

The electric railway operator knows that the public expects of him: (1) a vehicle which approaches as nearly as possible in mass transportation the comfort of the automobile; (2) increased speed; and (3) dependability. The public wants equipment that is attractive in appearance and quiet in operation. It is very critical of any lack of efficiency or courtesy on the part of operators. Given the right kind of service, the large majority of the urban residents would rather use a public conveyance for business errands and to and from their places of employment than to suffer the annoyances of traffic congestion and lack of parking facilities to which they are subjected when using private automobiles.

To have reached an understanding of the demands of the public and to meet these demands are quite different things. An industry which for more than a decade has had to struggle for bare existence cannot be expected to be in the best trim for rejuvenation overnight. Nevertheless, great progress has been made, and is being made, in modernizing service.

Proper development of franchise provisions, efficient management, adequate street and traffic control by municipalities and the encouragement of common carriers by public regulation which permits a fair rate of return are all essential to successful transportation planning. It is important that there be an understanding on the part of the community of the economics involved in local transportation. The people must realize that facility of communication is the very basis of existence of cities, and that improved methods of general transportation are at the root of city growth. They must recognize that the success of the city is more dependent upon good means of circulation than upon any other factor under its control.

They must also be brought to understand the relative value of various means of transportation. The automotive vehicle has been so prominently before the public and the demand for street space for it has been so great that the people ascribe to it a greater importance in city transportation than it possesses. For example, in the report on the economics of rapid transit, published by the American Electric Railway Association, it is shown that the northwestern division of the Chicago Rapid Transit Lines north of Chicago Avenue would cost to reproduce approximately $2,500,000 per mile. A parallel boulevard, 100 ft. wide, through this same zone if built now would, in the first 5 miles, cost approximately $4,250,000 per mile. The present use of the northwestern branch for the rush hour is about 30,500 persons in the northbound direction, and its ultimate capacity, if used like the rapid transit lines in New York City, would be substantially 100,000 passengers per hour.

A boulevard 100 ft. wide used to its capacity by automobiles could not serve more than 4,100 persons per hour in a northbound direction. In other words, it would take seven and one-half boulevards used by automobiles to give the same capacity in an outbound direction as the present use made of this one line, to say nothing of its ultimate capacity. To get this capacity in boulevards would cost approximately $32,000,000, and would destroy a strip of land for housing purposes 700 ft. wide throughout the entire length of the improvement. No one argues that cities should not provide facilities for automobile traffic, but it is high time that some consideration be given to the relative expenditure of money on the basis of the total number of persons to be served.

In many communities progress is being made toward the working out of a sane and sound plan for the development of local transportation. The fact that so much has been accomplished within the last two or three years indicates a growing understanding on the part of the public, and a keener desire on the part of managements to provide better service. A recent example of this is provided by the city of Chicago where, within the last 2½ years, enabling legislation has been obtained from the State General Assembly, a comprehensive plan for unification and development of all local transportation facilities has been worked out, and the necessary ordinances have been enacted by the City Council and approved by the people by a vote of nearly six to one. It is not contended that the ordinance for a comprehensive, unified local transportation system in Chicago is perfect, but it embodies many principles of the economics of transportation which are today recognized as essential.

Under the ordinance, which is now before the courts for judicial approval, Chicago will have a unified local transportation system, comprising, under one management, rapid transit, surface and bus lines, with transfer privileges between the three classes of service. The rapid transit lines will consist of elevated tracks and city-built subways. The new company, which will take over the existing properties, will expend $200,000,000 in the first ten-year period on extensions and improvements of rapid transit and surface service, and the city will expend approximately $100,000,000 on the subways, which will be equipped and operated by the company. This is more money for improvements than the present value of surface and elevated properties.

Special assessments, based on the principle of requiring the property immediately benefited to pay part of the cost of the improvement, will be utilized in financing the city-built subways. The company will pay 3 per cent of its gross revenue into a special city fund, which can be used only for transportation purposes. It will be relieved of many of the special taxes which the present companies are now required to pay.

Regulation will be by a local transit commission, which must allow a sufficient rate of fare to provide an adequate return on the investment. The property will be operated under an indeterminate permit. This set-up will enable the company to provide not only for immediate needs, but also to work out a sound financial policy suitable for the development and continued growth of transportation commensurate with the needs of the community.

The plan recognizes these four important principles:

1. That subways for local transportation are, in fact, but an additional street for the accommodation of the public, and, as such, should be paid for by the city in part by special assessment in the same way as streets are built for automobiles.

2. That co-ordination of all local transportation service under one management is essential to economy and efficiency in operation.

3. That equal opportunity for making use of the various transportation facilities should be afforded, so far as possible, to all residents of the community.

4. That rapid transit is essential for long-distance riding, and that surface and bus lines are most effective when used as feeders to the rapid transit lines, for short rides, local service, and to serve neighborhood business communities.

These principles are important in planning any large city service. Their incorporation in State law and franchise provisions is a long step forward.

In addition to the progress made recently in franchise planning, the electric railways of the country are beginning to achieve definite results in the improvement of equipment to fit modern conditions. An outstanding example of this is the trolley bus. Its many advantages over both the street car and the motor bus for certain kinds of service are now very generally recognized. In Chicago, where more than 100 trolley buses are now in operation, this vehicle has met with general public favor. Its quietness of operation, its comfortable riding qualities, its comparative freedom from equipment failures and the absence of exhaust gases are among its strong points. In Illinois the trolley bus has been classified legally as a street car, thus saving the cost of motor vehicle license fees, which, together with the saving on gasoline taxes, amounts to a considerable sum saved annually as compared with the use of gasoline buses. This permits more and better service to be given.

The trolley bus—a type of vehicle particularly well fitted to meet certain kinds of transportation demands—is becoming increasingly popular

Material modernization in car equipment, under the leadership of the Electric Railway Presidents' Conference, also promises to contribute much to the forward movement in the improvement of the electric railway industry.

It must be apparent, even to the most

gloomy pessimist, that the industry at last is emerging from the doldrums of the post-War period. It is setting its face confidently toward a future which holds promise of a sound financial and physical structure, designed to meet all of the needs of local transportation service.

What has been said here is applicable for the most part to electric railway properties in the larger cities. The circumstances and problems in smaller cities are somewhat different. There the automobile has proved a greater menace, and as earnings have decreased, ability to provide proper service has diminished. These smaller properties encountered difficulties to which the larger properties are not subject. But even in smaller cities there are ample indications of a better understanding of the problems and a more hopeful prospect of their solution. Some properties, even during the present depression period, are earning a good rate of return because of effective analysis and solution of the transportation possibilities.

In many of these cities street cars may not be the best units for service. The cost of paving construction, the maintenance of track and the payments of special taxes or charges for the privilege of operation create such an added burden in carrying charges that the properties cannot be made to pay, because these costs are balanced against too few fares per mile of track. Yet these cities must have some kind of public transportation.

Smaller cities hope to grow larger. Even to survive, they must have comforts, conveniences and necessities. Among these are numbered adequate water supply, schools, industries with good payrolls, competent merchants, park systems and public spirited citizens willing to plan for the community's welfare. All of these are useless, however, unless there are also provided adequate facilities to permit citizens to travel conveniently and economically between homes and work—to schools, to shops, stores, offices, to amusements and on the myriad errands of daily life. Can every man, woman and child, every office boy or clerk, operate his own automobile or beg a ride from a neighbor? Can the streets or vacant lots store these cars when they have arrived at highschool, at department store, or at the bank, A community small enough that its citizens may have the alternative of walking can perhaps get along with the automobile as the sole agency of local transportation. But such a small town cannot hope to realize the dream of most small towns—to grow into a city. What business could afford to move to such a community, or if there, could hope to do more than a mere country store trade?

Business men and citizens' representatives must be awakened by illustration and education as to the possible solutions appropriate to each city's problems. An answer can be worked out that will give the citizens the lowest costs of living and most desirable city growth, that will promote the best prosperity of the business men and of the citizens even while permitting a satisfactory return on the investment in the transportation system. There is no uniform prescription or standard answer as to the details of a plan, but there is absolute certainty that no city can afford to fail to work out for its own welfare a satisfactory way of maintaining some public form of communication.

Whether the city is large or small, however, there are certain factors which enter into any successful planning for the future of transportation. In the first place, the franchise must be such as to give assurance of permanency. It must be fair enough in its terms to encourage investors to supply the money that will permit improvements which will encourage riding. This, in turn, makes progressively better transportation service and then encourages more people to ride on public carriers. There must be incentive in the form of opportunity to earn adequately on the investment in order to encourage efficient management and to assure a high degree of responsibility on the part of the company in managing its own affairs and in assisting the city in problems common to both the city and the transportation system. Franchise provisions must be such as to remove unfair burdens and limitations which interfere with good operation. The management must have the power to readjust its lines and routes and to expand its service. Political control of operation or schedule requirements is inefficient and wasteful and should be eliminated. Traffic segregation should be encouraged by city and company and appropriate regulations for the use of the streets by all classes of traffic should be worked out on a co-operative basis. Unfair competition from independent bus systems or flat-rate taxicab systems, which cannot in themselves be profitable, is deadly to good local transportation service and it certainly should not be permitted.

On its part, the company must maintain a management of such quality as to justify public faith in its ability to provide adequate transportation and at a reasonable fare. Such a management will develop a thoroughly trained group of men and will keep its costs well under control by the most efficient use of its facilities and the highest degree of skill in planning and supervision. Vision, sales ability and a high quality of leadership on the part of the management are necessary to success in winning and holding public good will. The local transportation industry is in a state of transition, and it can look with confidence toward a time, not far distant, when it will be fully re-established financially and able, therefore, to give a superior service to the communities which depend upon it for their growth, prosperity, and, in fact, for their very existence.

Typical Concentrated Business Center of a Large Metropolitan Area

Although outlying business districts are developing rapidly in many cities the congested central areas offer an increasingly serious problems to transportation agencies in moving their vehicles freely

Emblem of the
American Street
Railway Association

Emblem of the
American Electric
Railway Association

How the Association Has Aided the Industry

By

J. N. SHANNAHAN
Chairman Advisory Council
American Electric Railway Association

President
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Omaha, Neb.

IN 1882, a full half century had passed since the first street railway in the country was opened for service on the Bowery in New York, and, although the industry did not really begin to expand until the early '70's, developments came with a rush during the next decade, accompanied by tactics on the part of the promoters which were not always strictly ethical according to present-day standards. Each street railway, each executive, was a law unto himself, obliged to learn his own lessons, to work out his own salvation in his own independent way. Street railway managers were a hard bitten, highly individualistic crowd. They knew little of one another, and each guarded his financial and administrative methods as jealously as the guilds of the middle ages preserved their trade secrets. The average executive's association with others of his craft, generally confined to a competitor in the same city, was more apt to be unfriendly than otherwise. The mule, still supreme as the agency of motive power, often typified, as well, the unyielding, stubborn character of the chief executive.

And yet, at this time (it is still 1882 that we are talking about) the street railway business in the United States and Canada represented an investment of $150,000,000, a tremendous sum in those days. There were 3,000 miles of track and 35,000 employees. It is estimated that the companies that year carried an aggregate of nearly 1,250,000,000 passengers. Urban transportation was, in short, a major industry, even at that early period, but there was no central clearing house for the consideration of matters of common interest. And these matters were growing rapidly in number and importance.

IN SUMMONING the leaders of the street railway industry to meet at Boston for the organization of the American Street Railway Association, the following letter was sent to all companies in the United States and Canada:

Louisville, Ky.,
November 8, 1882.

Dear Sir:

Permit me to call your attention to a matter which has for some time been considered by a number of Street-Railroad men, viz.: The formation of an Association based upon well-established principles governing similar organizations, the object of which shall be the promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction, equipment and management of street railways; the establishment and maintenance of a spirit of fraternity among the members of the Association by social intercourse and friendly interchange of information and ideas, to the end that the best service may be obtained at the least possible cost.

With this object in view, I have been requested by a number of street railway officials, both in the East and West, to issue this circular, and urge that your company send a representative to a convention to be held in the City of Boston, on the 12th day of December, 1882, for the purpose of organizing and adopting a Constitution for the government of such an Association.

It is expected that most of the prominent street railway companies in the United States will be represented. Will you be kind enough to notify Mr. J. E. Rugg, Superintendent, Highland Street Railway Company, Boston, Mass., at once whether your Company will send delegates, in order that adequate accommodations for the Convention may be made in advance? As soon as replies are received, arrangements will be made, and you will be notified of the location and the hour the Convention will meet.

Very respectfully,
H. H. LITTELL,
Superintendent,
Louisville City Railway Company.

Finally, after several abortive attempts, following an exchange of letters between a number of the leading operators, a call for a meeting was sent out, and a handful of executives met in a Boston hotel Dec. 12, 1882, and organized the American Street Railway Association. Once the ice was broken, distrust gave way to confidence under the stimulus of personal acquaintance and contact. Soon there were forged close bonds of common interest, and these bonds, growing out of that meeting of the pioneers, have continued without break to the present time.

At this period, the business of local transportation was just beginning a cycle of rapid expansion and transition. It was apparent to many far-sighted operators that the horse must go, but there were serious differences of opinion respecting the agency of power that would take its place. During the first decade of the association's existence there was a constant search by individuals and groups for some better means of propulsion. Every suggested possibility which appeared to have any merit was subjected to serious study and experiment.

Hence, from its very inception, the association found itself the forum in which matters of great import to the industry were debated in all their aspects. Delegates came to the early conventions prepared to hear about the successful experiments with cable lines in San Francisco and elsewhere, and to discuss the relative merits of the variety of electrification projects then being advanced by that brilliant coterie of inventors which included Charles J. Van Depoele, E. M. Bentley, Walter Knight, Frank J. Sprague and Thomas A. Edison.

Increasing Importance and Scope of the Annual Conventions

Since that pioneer period, public transportation and the association which represents it have traveled far and fast. From humble beginnings in a Boston hotel room, the association has grown to be an institution of nation-wide extent and importance. Its early conventions—which were not always conventional—have developed into assemblies which draw thousands of delegates from all sections of the country. Its annual exhibit, which had its beginning in 1885, when twenty manufacturers displayed their wares in space provided by the Street Railway Journal, has developed into a veritable industry fair, occupying thousands of square feet of floor space, and representing an investment of hundreds of thousands of dollars. The papers and proceedings of its annual gathering attract the attention of operators, manufacturers and investors having a wide variety of interests.

From early discussions regarding the merits of blonde or brunette horses, their feeding habits and the ills that afflicted them, the subjects considered have broadened and ramified with the years. As the atmosphere became cleared of the suspicion and confusion that had surrounded the acquisition of some early franchises, there came a realization on the part of managements of the important mission their industry was destined to play in the development of the cities which they served. From matters closely political in character discussion turned more and more toward the engineering aspects and social importance of community transportation.

To the amazing—and amusing—history of that decade in our national annals which has been so aptly characterized as the "Gay Nineties," the street railways contributed a colorful and glamorous chapter. To the railways, more than to any other single influence, the development of our urban centers during that period can be ascribed. Without them, growth would have been checked and expansion would have been impossible. Quite naturally, the responsibilities of transportation managements grew rapidly and were sometimes obscured by the accompanying enthusiasm and optimism. If these often led to acceptance of committments which, at a later period and under changed conditions, were to arise to plague the transportation operator, let it be said to his credit rather than otherwise. With courage and vision he accepted the multiplicity of obligations imposed upon him, little knowing that in many cases destiny was awaiting around the corner armed with a club.

The annual dinner was an extremely entertaining climax to the convention of the early days

During most of this period, the Street Railway Association and its various committees carried on in a more or less perfunctory manner. There was no paid secretary and no permanent headquarters organization worthy of a name until 1904, but a considerable correspondence relating to various problems of interest had been carried on in the name of the association over a long period of years. Officers of the association made appearances from time to time before legislative bodies, and considerable effort in behalf of the industry was exerted in local and national affairs.

For nearly a quarter century the original name, American Street Railway Association, served its purpose well. Inclusion of many interurban railways in the organization made it seem desirable to adopt a name of broader scope. Accordingly at the 1905 convention the name was changed to American Street and Interurban Railway Association. Later it was decided to get rid of this rather cumbersome title, and at the 1910 convention the organization became the American Electric Railway Association, by which name it has been known for the past 21 years.

As the business expanded and became departmentalized, it led to the development of specialists who felt the need for the consideration of their own common problems. As the association did not provide an agency for this purpose, the various affiliated organizations came into being. The accountants organized at Cleveland in 1897, to be followed by the engineers in 1903, the claim agents in 1904 and the transportation and traffic men in 1908. At the Saratoga convention in 1903, the manufacturers, who had been closely associated with the parent body since its earliest organization, effected an organization of their own for the purpose of handling the annual exhibit, which had assumed important proportions.

During the midyear meeting held in Chicago in 1916 the constitution and bylaws of the association were amended so as to open up the membership to manufacturer companies. At the 1919 convention a final readjustment in the relationship between the railways and the manufacturers was effected by an arrangement providing for representation of the manufacturers on the Executive Committee. Since that date, they have worked with operators with a splendid singleness of purpose. Both on the Executive Committee and on the various committees of the affiliated associations, the manufacturer members have rendered faithful and valuable service. Their advice and co-operation has undoubtedly added much to the weight of the reports which have been rendered on various matters connected with engineering and operation.

The Association Has Guided the Industry's Development

From its inception, an important function of the association has been to acquire knowledge relating to the construction, equipment, management and operation of electric railways, and to disseminate that information among its members. Its purposes have been to improve practices in all departments of electric railway affairs, to establish and maintain a spirit of co-operation among its members, and to encourage friendly relations between electric railways and the public. The manner in which it has carried out these obligations is revealed by a review of the proceedings of the association covering the entire period of its existence. In the course of events, it has closely followed, and to no small extent influenced, many phases of the development of public transportation, including physical design, operating methods, economics and policies affecting its relations with the public and with its employees.

In 1911, under the direction of one of its committees, there was inaugurated the study of electric railway fares and the items entering into the expense of operation. This study culminated in the publication of "The Cost of Urban Transportation Service," the most complete and comprehensive study of the subject ever undertaken. Other studies carried on under the direction of the association have included such subjects as valuation, financing, franchises, workmen's compensation laws, and governmental and municipal regulation and control.

The Fare Research Bureau, which began its existence in May, 1914, performed a work of great value in defining and outlining fixed and variable cost factors, the trend of operating costs and the cost of rush-hour service. The bureau also investigated the experience of Cleveland and Toledo with limited-term franchises. In November, 1914, the association drafted and adopted a broad code of principles, defining in clear-cut terms the position of the industry upon many of the disputed problems of the day.

When the jitney made its appearance and began seriously to undermine the financial stability of many street railways, a special committee was appointed to consider and make recommendations to the various companies as to the manner in which this menace could be best combated. Within a surprisingly short time a report was prepared embodying an extensive and close study of the situation, accompanied by a statistical and technical study prepared by the Bureau of Fare Research.

In August, 1916, when the Adamson Bill, calling for an eight-hour day for interstate carriers, was jammed through Congress, the electric railways, which, under the first draft of the bill, were included within its scope, were specifically exempted through the prompt intercession of the then president of the association, assisted by the chairman of the Committee on Federal Relations.

Association Helps in War

Promptly at the outbreak of the World War the president of the association pledged to President Wilson the patriotic support of the electric railways in the furtherance of any measures which should be deemed necessary in the conduct of national defense. A committee was appointed to co-operate with the Council for National Defense, and a succession of bulletins was issued from association headquarters in support of such measures as fuel saving, increasing crop production, liberty loans, and the protection of national property at strategic points.

Later, in November, 1917, there was organized under the auspices of the association, a War Board for the purpose of co-ordinating the facilities of the electric railways of the country and to place them more effectively at the command of the government and of industry. Meetings of the board were held at frequent intervals during the period of the conflict, and questions having to do with taxation, labor difficulties, necessary financing of construction, etc., were settled with the minimum of delay. Space is lacking wherein to tell in detail of the accomplishments of the board. It should suffice to say that its efforts and accomplishments were such as to warrant the commendation of the War Department. The efforts put forth during this period served as nothing else could to nationalize the industry. Confusion of counsel was eliminated. Unity of purpose was accomplished.

Another interesting banquet program cover, showing the first street car in America and two "modern" vehicles

In the difficult days of reconstruction following the War, the association and its various committees took an active part in stabilizing the industry in the face of unsettled conditions. The War Board became the Committee on Readjustment. As the result of high price levels and disturbed labor conditions, and of the failure of the prevailing 5-cent fare in many cases to provide necessary revenues and maintain the properties, the electric railways found themselves in a critical situation. To a large extent credit was lacking, and in many localities the companies were not properly performing their functions. The 5-cent fare, it is true, had begun to give way rapidly by the time the War was over, but other spectres, had, in the meantime, arisen to plague the railways. When, in June, 1919, President Wilson appointed the Federal Electric Railway Commission to investigate the affairs of the transportation companies, the association's Executive Committee appointed a committee of 100 men, selected from the leading executives of the industry, to co-operate with the commission in presenting the position of the electric railways.

Hearings continued before the commission for months, and out of them were developed and disseminated many of the principles which constitute the fundamentals of sound community policy with respect to local transportation at the present day. Under this category may be included the inauguration of the movement for the elimination of special taxes for sprinkling and paving. To the work of this committee can also be traced the beginnings of adequate regulation of jitneys and other motor competition, and the earliest efforts toward the financing of extensions into new territory by the property thus benefited. From this period, too, and out of the post-War emergencies can be said to date the first comprehensive efforts toward the establishment of better public relations through publicity and advertising, in all of which the association took an active part.

Up to the filing of the commission's report, the electric railway industry, in theory at least, had been conducted upon the principle that the parties interested were the municipalities on the one hand and the companies upon the other, and that their interests were of necessity hostile. As the outgrowth of the commission's findings it became apparent, as never before, that the public at large had a real stake at issue, and that the interests of the public, the municipalities and the railways were closely interwoven and dependent one upon the other.

Committees Have Been Active in Studying Many Problems

The association early learned the value of doing much of its work through the agency of committees. They may be said to constitute the very basis of the association's usefulness. Upon the personnel of its committees and upon the diligence with which they pursue the problems assigned to them depends in large measure the success or failure of the organization. And in this respect they have not failed. In their membership, these committees have represented over the years the highest business and professional ability to be found in the special fields of inquiry undertaken. Carefully and painstakingly prepared with the assistance of the association staff, their reports rank among the best management and technical publications produced by any branch of technology or industry. Sound, practical advice and suggestions have in this manner been made available.

No single electric railway could hope to make such complete investigations

At the Pittsburgh convention in 1891 the manufacturers exhibited their products on steamboats and barges

into a variety of subjects as the committee reports afford. The cost would be prohibitive and the information would be most difficult to obtain. The problems of so important an industry will always require study and thought, and it is highly essential that those who are to solve them have at their disposal the very fullest and detailed information that can be made available. As an agency for supplying this information, the association has proved itself to be particularly well fitted.

The Engineering Association, organized in 1903, has as one of its objectives the promotion of uniformity of practice—that is to say, of standardization. This objective is kept constantly before its committees and usually constitutes an important part of their work each year. As an outgrowth of this phase of the association's work, there has been developed over a period of years the Engineering Manual, a handbook of standards, recommendations and miscellaneous practices, which has become a reference volume of great value.

The standard classification of accounts as laid down by the Interstate Commerce Commission for the guidance of electric railways is today the basis of all correct electric railway accounting. And the standard classification, in its present form, was made possible through the unselfish and untiring efforts of the American Electric Railway Accountants' Association.

In 1925 there was created what came to be known as the Advisory Council, composed, in the main, of the principal company executives and representatives of the large owners. This was done to interest these men directly in the administration and functioning of the association, and to secure their active co-operation in formulating its policies. The council, in common with the Executive Committee, functions through the managing director of the association. In this way, there is one man clothed with the necessary authority to speak for the association and its membership. Only in this way can this industry give authoritative voice to its views on the problems that confront it.

There is another important matter which is liable to have a most vital bearing on the future of the local transportation business. Believing, as one must in these days, that the industry or business which does not inaugurate and carry on active research work is destined to be relegated far to the rear, the officers of the association undertook to develop a program of intensive research and to devise ways and means of financing the cost. It seemed to these men that this program should not be directed nor carried on by the association, as such, but by a separate organization. There was, therefore, created for the purpose, what is known as the Electric Railway Presidents' Conference Committee. The cost of the work was underwritten by a group of operating and manufacturing companies.

This having been accomplished, the Conference Committee soon realized that the successful outcome of their project depended upon the man who was chosen to have responsible charge of the research work. The chairman of the Presidents' Conference Committee, Dr. Thomas Conway, Jr., who, with several others, had first voiced the need of this program of research, gave a great deal of time and thought to the selection of the chief engineer. The man chosen was Prof. C. F. Hirshfeld, of Detroit. He had, it seemed, pre-eminent qualifications for the post, and has the full confidence of all those who are associated in the movement.

Through all the years of its development, the policies of the association have been wisely planned and efficiently carried out. But however valuable its work may have been in the past, it cannot rest upon laurels already won. In order to endure it must continue to be alert to changing trends, new responsibilities and the needs of the future.

To function best it must have the active interest and co-operation of its member companies and their executives. It provides all the machinery needed for individual companies to help themselves on common problems. But unless this machinery is fully utilized, it operates at only partial efficiency. As time goes on, the association serves to knit the industry closer together. This group consciousness may be made almost irresistible if wisely guided and directed. It is through increased collective action that we may expect to master the many baffling problems which continue to beset us, but which in large measure differ only in details as they are encountered on individual properties.

Many conditions affecting our industry are national in scope. They must be met in a national way, with every company closely united in the work. The wisdom and experience of the best men in the industry, in the future as in the past, are needed to establish and promulgate the principles upon which the industry is to proceed. There is a constantly increasing need of spokesmen removed from local prejudices, free from local animosities and able to speak with authority. No single company can provide this; no sectional group can do this. The association alone can properly fulfill this very necessary function.

From the first showing of street railway products in 1885, the annual exhibit has developed into a tremendous and spectacular display of transportation equipment

Some Important Dates in the Industry's History

1832—First American street car line, on the Bowery, New York City.

1833—Henry invented his "electric engine."

1835—Davenport made several motor car models, using batteries. Fundamental idea of motor for propulsion patented in 1837.

1838—Davidson exhibited electric locomotive with batteries at Aberdeen.

1840—Pinkus granted first patent for an electric railway.

1847—Lilley and Colton developed model locomotive using rails for conducting current from stationary battery.

1847—Farmer developed first electric locomotive in America at Dover, N. H.

1850—Hall exhibited an electric motor car at the Mechanics' Fair, Boston.

1851, April 29—Page operated battery car train between Washington and Bladensburg, 5 miles, at 19 m.p.h.

1859, May 10—Beers patented a 1½-in. rail to be laid on wooden stringers.

1861—Siemens invented dynamo.

1863—London Underground opened first subway in world, using steam.

1867—Pacinotti discovered the reversibility of the dynamo.

1868, June—Harvey tried cable drive locomotive on ½-mile elevated line in New York City, the first elevated in America.

1871, April 20—Steam dummy and three cars used on Ninth Avenue Elevated in New York City, the first commercial rapid transit line in America.

1873—Van Depoele exhibited a motor for tractive purposes.

1873, August—First street cable line put in operation in San Francisco.

1875—Green, of Kalamazoo, made first use of an overhead trolley.

1877—First girder rail rolled by Cambria Iron Company, at Johnstown, Pa.

1879—Siemens and Halske, at the Berlin Industrial Exhibition, propelled a miniature locomotive and three cars with power from a dynamo.

1880—Edison ran small locomotive at Menlo Park, N. J., using power from a dynamo and a third rail.

1881—Field ran a large motor car at Stockbridge, Mass., using a dynamo, a wire in a conduit and a rail return.

1881—Daft conducted early experiments.

1881 — Hopkinson proposed series-parallel control.

1881—Siemens and Halske started first commercial electric railway in world at Lichterfelde with two cars.

1882—Van Depoele installed system at Chicago, current conveyed by wire.

1882, Dec. 12—American Street Railway Association, now the American Electric Railway Association, organized at Boston.

1883—Edison, Field, Mailloux and Rea operated a 3-ton locomotive, "The Judge," with third rail at the Chicago Railway Exposition.

1883—Van Depoele ran car at Industrial Exposition in Chicago, using an overhead and over-running trolley wheel.

1883, November—Daft operated 2-ton locomotive, "Ampere," on 12-mile line of Saratoga & Mt. McGregor R.R.

1884, July 27—Bentley and Knight opened first commercial electric railway in America at Cleveland, using underground conduit system.

1884—Van Depoele operated train at Exposition in Toronto, using underground conduit.

1884, November—First issue of Street Railway Journal appeared, the outgrowth of a street railway department in the *Journal of Railway Appliances.*

1885, August—Daft opened commercial line between Baltimore and Hampden, using a third rail with wheel for contact and later overhead.

1885—Henry built electric railway at Kansas City, with two overhead wires and over-running trolley wheels.

1885, Aug. 26—Daft locomotive, "Benjamin Franklin," on Ninth Avenue Elevated, New York City, marked first use of electricity on an elevated line.

1885, Oct. 21-23—First Convention Exhibit, at St. Louis, sponsored by Street Railway Journal, twenty exhibitors.

1886, November—Montgomery, Ala., with Van Depoele system, was first city in world where street railways were run entirely by electricity.

1888, February—Sprague system at Richmond with 40 cars was largest installation to date and embodied advanced designs.

1888—First commercial freight locomotive built for service in Ansonia and Derby, Conn.

1890—Minneapolis - St. Paul line of 9 miles first permanent interurban.

1890—Westinghouse Electric & Manufacturing Company entered the electric railway field.

1892, April—General Electric Company formed as consolidation of Thomson-Houston, Edison General Electric, the Sprague and other companies.

1893—General Electric exhibited a 30-ton freight locomotive at the Chicago World's Fair.

1893, April 20—Elevated Intramural Railway at World's Fair, Chicago, opened, using motor cars and trailers.

1895—First heavy interurban line, from Cleveland to Akron, 25 miles.

1895—Synchronous converter first used in railway work, Lowell & Suburban Railway.

1895, May 17—First permanent all-electric elevated in America opened, the Metropolitan West Side in Chicago.

1895, June 30—New Haven started commercial service on its electrified Nantasket Beach line.

1895, Aug. 4—Baltimore & Ohio started regular freight operation through electrified tunnel in Baltimore, after a month or more of trial.

1897, March 23—Street Railway Accountants' Association of America organized at Cleveland.

1897, September—First subway in America opened at Boston, for surface cars.

1898—Multiple-unit control first used, South Side Elevated, Chicago.

1899—Siemens and Halske introduced first trolley bus in world at Berlin.

1899—First underground rapid transit line in America opened at Boston, using multiple-unit trains.

1901—First American trolley bus demonstrated by Eastern Trackless Trolley Company, of Boston.

1903, Feb. 16—American Railway Mechanical and Electrical Association, organized at Cleveland.

1904, April—Imperial Transit Company operated gasoline motor bus line in St. Louis.

1904, Oct. 12—Street Railway Claim Agents' Association of America organized at St. Louis.

1905—First electrified suburban service inaugurated by Long Island Railroad.

1905—Interpole railway motor introduced.

1905, August — Interurban bus line opened from Springfield to Jamestown, Ohio, 22 miles, by electric railway builders, three Oldsmobile buses.

1905, Sept. 27—Name of association changed to the American Street and Interurban Railway Association.

1905, October—Fifth Avenue Coach Company, New York, ran first gasoline-electric bus.

1906, April 27—American Street and Interurban Manufacturers Association organized.

1907, August—Fifth Avenue Coach Company placed fifteen gasoline buses in service, the first large motor bus line.

1908—New Haven Railroad electrified with single-phase, 11,000 volts.

1908, Jan. 30—American Street and Interurban Transportation Association, organized at New York City.

1908, June—Street Railway Journal purchased *Electric Railway Review* and formed Electric Railway Journal.

1910, Sept. 11—First commercial trolley bus system in America started in Laurel Canyon, near Los Angeles.

1910, Oct. 10—Name of association changed to the American Electric Railway Association.

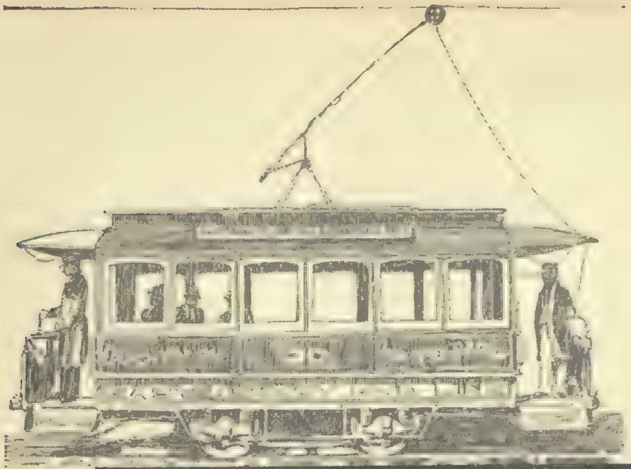
1914—Mercury arc rectifier tried for railway service by Pennsylvania R.R.

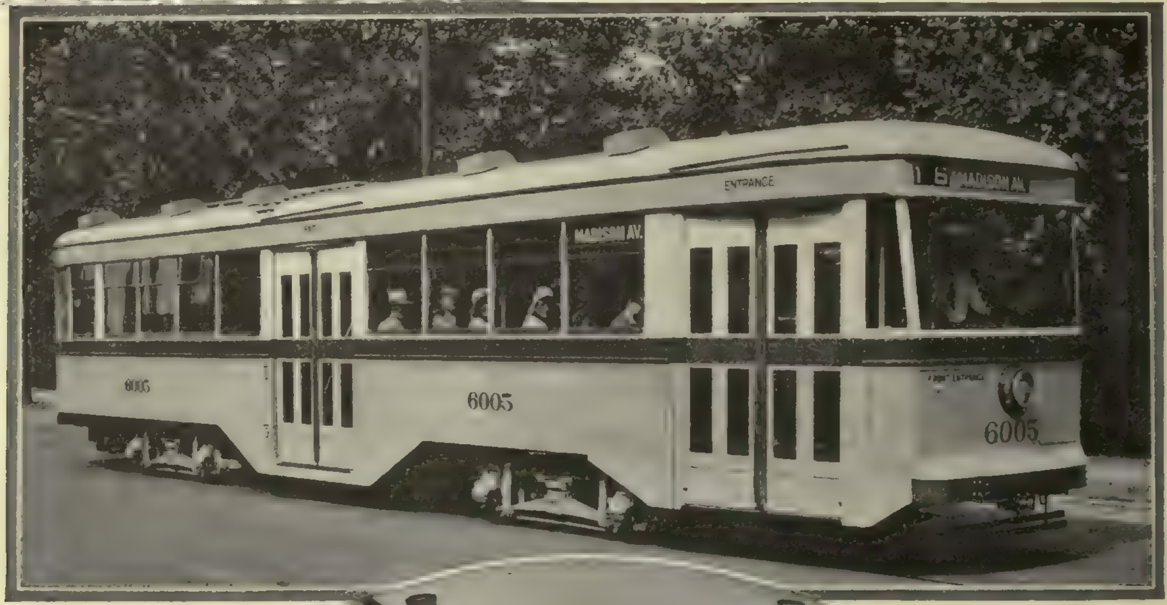
1914, July 1—First jitney appeared in Los Angeles.

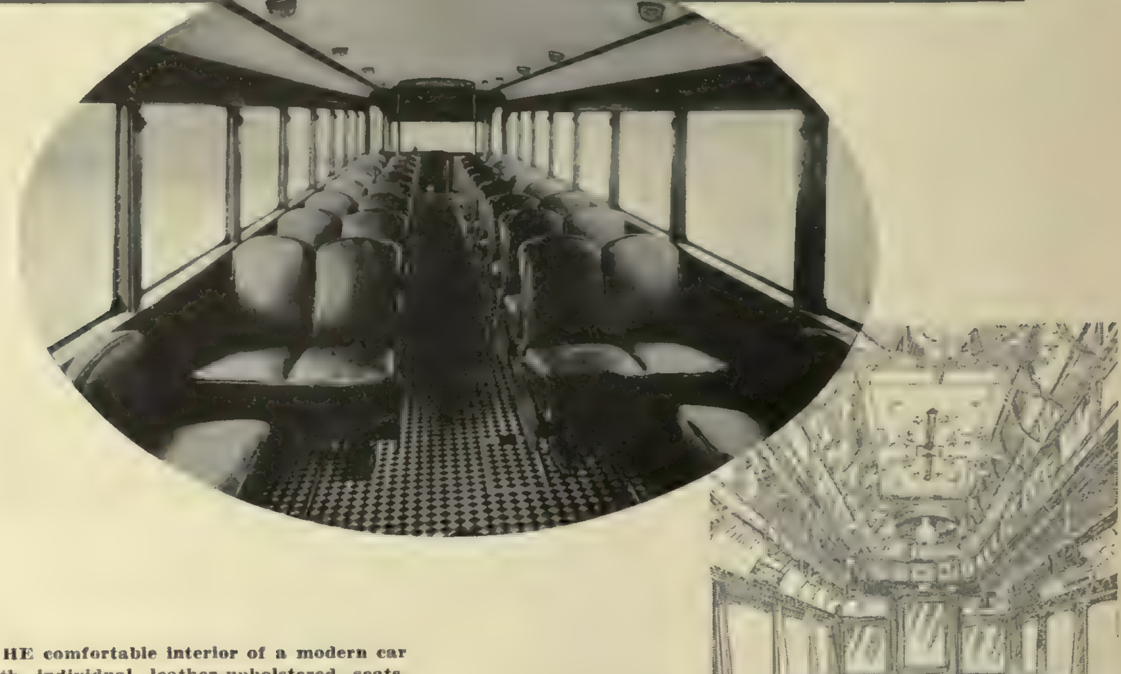
1916, Nov. 1—Birney safety cars for one-man operation in Fort Worth.

The Old and the New

One of the original four-wheel cars which were operated on the Sprague system at Richmond in 1888, and one of the roomy, attractive cars placed in service in Baltimore in 1930







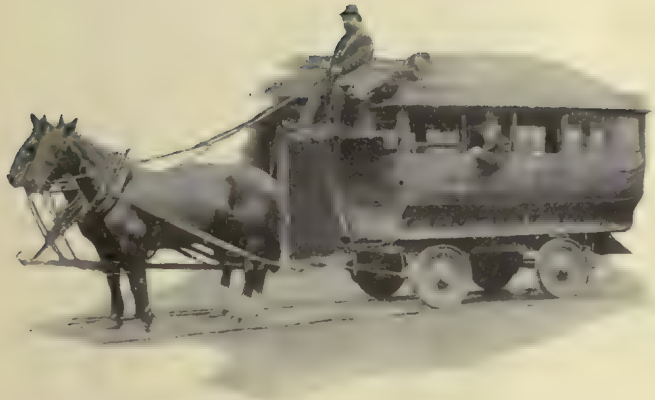
The comfortable interior of a modern car with individual leather-upholstered seats, dome lights and attractive flooring presents a striking contract to the old "luxurious interior" with carpet-covered benches, oil lamps and straw-littered floor

Car Design

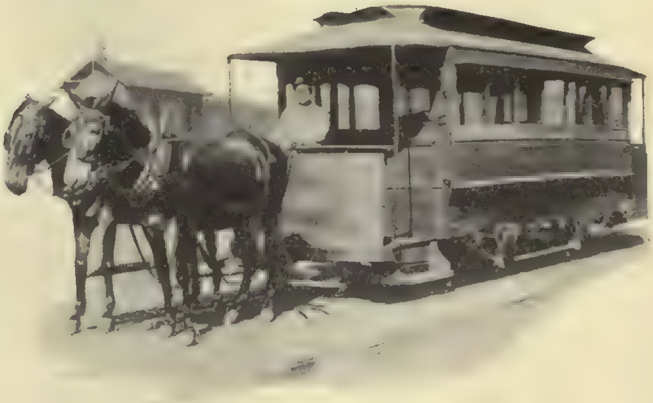
Reflects Steadily Rising Standards of Service

By

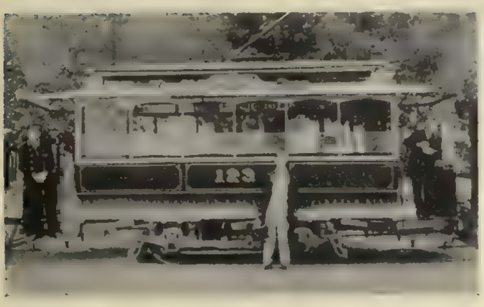
JOHN A. MILLER
Editor
Electric Railway Journal



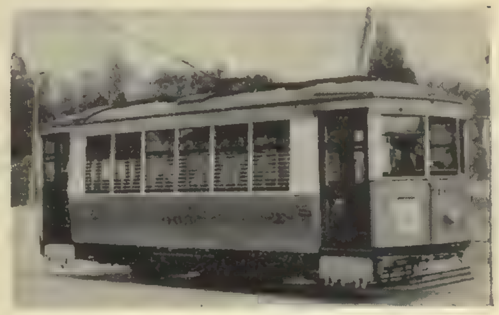
Omnibus-type horse car with entrance at center of rear end



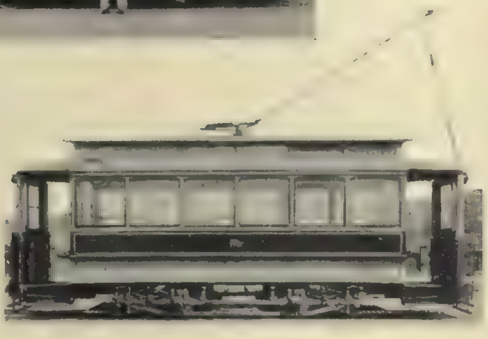
Mule-drawn street car with end platforms



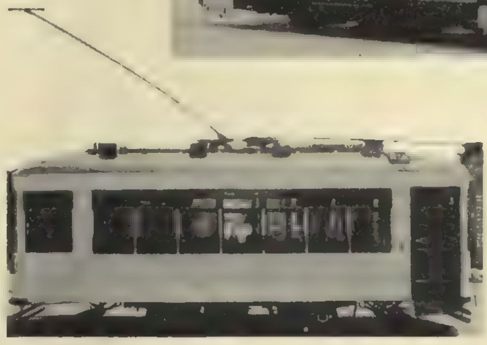
At left—early single-truck electric car



At right—A modern single-truck car with front entrance and automatic rear exit



Improved type of single-truck car with partly inclosed platforms



The Birney car, which came into widespread use about 1916

WHEN public transportation vehicles were first introduced in England late in the seventeenth century, they were denounced as a pernicious evil. Before then a person who owned no private conveyance had been accustomed to walk or ride a horse from place to place. This condition was generally accepted as being entirely fitting and proper. When public coach service began, one critic expressed the opinion that "Those who travel in the coaches contract an idle habit of body; become weary and listless when they have rode a few miles, and are then unable to travel on horseback and not able to endure frost, snow or rain, or to lodge in the fields." Considering the crudeness of the early coaches, which had no springs and few cushions, this fear of the enervating effect of their luxury seems to have been somewhat exaggerated. But crude though these early coaches were, they represented the first step in the development of the commodious and comfortable public transportation vehicles being operated today over thousands of miles of railways and highways.

Coach service between towns began long before it was thought necessary to have local service within the limits of any single city. Thus the earliest ve-

Old-style double-truck car with open platforms

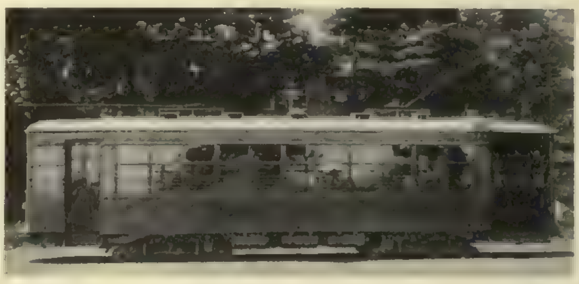
Double-truck car with partly inclosed platforms

hicles were designed for comparatively long hauls. Accommodations were provided for only a small number of passengers, seldom more than ten. Seats were transverse, some facing forwards and some backwards. Entrance and exit were by means of a small door in the center of the side. The driver was seated on the roof at the front end. Sometimes there were seats for passengers, too, on the roof.

When coaches were introduced in local service it was found necessary to increase the seating capacity and to provide more convenient facilities for passenger ingress and egress. To meet these needs a vehicle was developed with seats placed longitudinally and the door located in the center of the rear end. The position of the driver remained the same. Passengers paid fare by passing their money through a small aperture alongside the driver's seat. Most of the horse-drawn omnibuses in city service before the beginning of the era of street railways were of this type.

The design of the first street railway car in the United States, the "John Mason," operated on the New York & Harlem Railroad, followed the older omnibus design with side doors, but this style was soon abandoned in favor of the rear door. In general, the earliest street cars were nothing more than omnibus bodies mounted on flanged cast-iron wheels. The greater ease of hauling vehicles on metal rails, however, encouraged the adoption of larger car bodies. An open platform was added at one or both ends of the car body. The driver's position was changed from the roof to the platform. On heavy routes, a conductor was added to the crew to aid in the handling of the passengers, he taking his position on the platform at the end opposite from the driver. During the comparatively short era of the cable car no important innovations in design were made. The double-end open-platform car already described was in use throughout the country on both horse and cable lines when the first electric operation began.

Semi-convertible car—very popular about twenty years ago



Recent type of light-weight double-truck car with arch roof

The bodies of the early electric cars followed the same design as the horse cars. With the rapid expansion of electric operation, however, a great variety of other body designs were soon developed. Some have since been abandoned while others have continued with more or less modification until the present day. To describe them all in detail, with the dates when they were developed, would require a volume. Moreover, similar designs were often brought out practically simultaneously in different places and it is scarcely possible to establish a definite order of priority. For that reason consideration in this article will be limited to general trends.

Classification of car designs is based upon a number of characteristics such as the service for which the vehicle is used, its size and construction, and the method of operation for which it is intended. Under the heading of service, passenger cars fall into three major groups: city, interurban, or rapid transit. Under the heading of size and construction the principal classifications are single truck or double truck; single deck or double deck; open, closed or some combination arrangement. Under the heading of operating characteristics the classification is according to the door arrangement, and whether it is designed for operation in both directions or only one.

The history of the industry shows some significant changes in the trend of design of cars for city service. As has already been mentioned, the bodies of the early electric cars followed the general design of their forerunners—the horse cars. They had short bodies mounted on four wheels. At first the axle boxes were attached individually direct to the framework of the car. Soon, however, it was found desirable to mount both axles in a separate framework, or truck, upon which the body rested. Thus was evolved the single-truck electric car.

As electric railway service increased in popularity, it became desirable to increase the size of the car. The limit of length of body which could be satisfactorily carried on a single four-wheel truck was soon reached. A new design was then developed whereby the car body was supported on two independent four-wheel carriages, or trucks, pivoted near the ends of the body. This design had been adopted many years before by the steam railroads. A number of proposals had been made from time to time for the use of double-truck horse cars, but at the time of the introduction

At left — The first "automotive" type street car brought out in 1927

At right — Large capacity front-entrance center-exit car for heavy city service of electricity as a motive power for street cars, the single-truck vehicle was in almost universal use. Just when double-truck cars were introduced on the electric railways is uncertain, but it was at an early date.

As time went on, the double-truck car became increasingly popular, and the single-truck car began to fade from the picture. In 1916, however, a notable reversal occurred. Efforts were then being made to reduce the weight of cars, and to provide more frequent service. To meet these needs, the so-called Birney car was developed, a light-weight, single-truck car, arranged for one-man operation, and provided with special safety devices. During the period of the World War and the years immediately following, this type of car achieved a considerable measure of popularity. While its light weight and low operating cost were undoubted advantages, the riding qualities of the original type of Birney car did not fully meet the increasing public demand for comfort in transportation vehicles.

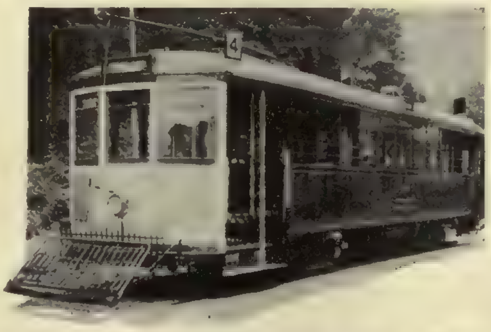
Utilizing the experience gained with the Birney car, however, the designers in 1924 brought out a light-weight, double-truck, one-man car. This type of vehicle possessed many of the same advantages as the light-weight single-truck car and had better riding qualities. During the past ten years it has achieved marked popularity and has been widely used for many kinds of service.

Recently articulated units have been developed consisting of two car bodies mounted on three car trucks, one at the outer end of each body, and one at the center common to both. In this way, a large capacity is provided with comparatively light weight. Because of this and because the unit can be operated satisfactorily with only two men, it has certain advantages over two cars coupled together in a train. Its use, however, has been limited to a few of the larger cities and some interurban lines.

A second method of classifying car bodies from the standpoint of construction depends upon the number of decks. In England, and in some British colonial lands, double-deck cars have been used extensively for many years. A few double-deck horse cars and cable cars and one steam-motor car were built in this country in the early days of the street railways. Attempts have been made at various times to introduce double-deck vehicles on the electric lines, notably in New York City and Pittsburgh. The design has not met with marked favor here, however, due principally to the unwillingness of passengers to climb up and down the stairs to the upper deck. At the present time there are no double-deck electric railway cars in operation anywhere in the United States.

Open cars of this type were very popular some years ago

Sixteen-bench open car with sides screened and end doors installed for one-man operation


California type car with closed center section and open sections at both ends

During the era of greatest development of the horse car, open cars were widely employed for summer service. While the first electric cars were of the closed type, the open car soon came into extensive use on the electric lines. Its popularity continued until some years after the turn of the century. But the introduction of the pay-as-you-enter method of fare collection in 1905 occasioned a swift decline in the popularity of the open car among street railway men, as these cars were not considered well adapted for such operation. Another factor partly responsible for their decline was the added cost of having duplicate sets of cars for summer and winter service. More recently, the open car has regained a measure of its former popularity. Some companies having cars of this type available, have operated them during the summer months, using two men and the old-fashioned method of hand collection of fares. Others have screened the sides of the cars, and arranged them for one-man operation. No new open cars have been built in recent years, however, and there appears to be little likelihood that they will play an important role in the future.

Compromise designs between open and closed cars have been developed at various times. One of these was the "convertible car" with removable side panels developed about 1895. Later came the "semi-convertible car" with permanent side panels below the seat level, and windows arranged to be raised up against the roof, leaving a large part of the side open. At one time a half-and-half car was tried in New York and some other Eastern cities, with one section open and one section closed. This compromise, however, seemed to please nobody. In fair weather, everyone wanted to be outside, and in bad weather everyone wanted to be inside. A somewhat similar, but more successful, design is the so-called "California-type" car. This has a closed section in the center and more or less open sections in the ends. Under the climatic conditions prevailing on the Pacific Coast where this type of car is used, it has

This double-deck open car was tried at one time, but did not prove successful in regular service

Experimental double-deck car operated for several years in New York City—since discontinued

Old type trailer train of single-truck cars

A more recent type of trailer train composed of double-truck cars

Light weight multiple-unit train

Multiple-unit train for heavy city service

Articulated unit with two car bodies mounted on three trucks

Latest type of M-U car for rapid transit service

proved very popular and is being operated extensively at the present time.

Operating conditions have had a marked influence on the design of cars used on many railways. Classification of car bodies under this heading depends on whether or not the car is capable of being operated in both directions and also upon the arrangement of entrance and exit facilities.

In the days of horse-drawn omnibuses, the vehicles were all designed for one-way operation. When rail vehicles were introduced, they could not be so easily turned around and a problem arose concerning means of reversing direction. The original street car, the "John Mason," was designed for operation in either direction. But this style of vehicle was soon abandoned in favor of the car already described with entrance in the middle of the rear, frequently called the "bob-tailed" car. This could be operated only in one direction, and turn-tables or similar devices had to be provided at the ends of the route. The bob-tailed car was superseded by the car with an open platform at each end, which could, of course, be run in either direction with equal facility.

Although some single-end electric cars were built in the early days, the double-end design remained the favorite until the introduction of pay-as-you-enter operation. With this type of fare collection it was found desirable to have an ample rear platform where a comparatively large group of passengers could stand while waiting to pay fare rather than to have them wait on the street and thus delay the starting of the car. During the decade 1905-1915 a great many single-end cars with large rear platforms were built. Track loops or wyes were constructed to enable them to reverse direction. This added expense was more or less offset by the saving in control and braking equipment, wiring and piping on the car. On some routes, however, no convenient means of turning could be arranged, and double-end pay-as-you-enter cars came into widespread use, with platforms smaller than those of the single-enders.

Although recent years have seen marked changes in operating practices, the basic factors in favor of and against the single-end car remain virtually unchanged. It is simpler and easier to build. Fewer doors are necessary and only one set of electrical controls is required, so that it costs less. Its appearance is ordinarily more attractive than that of a double-end car. On the other hand, it is less flexible in service because of its inability to reverse direction except at certain fixed points.

In the days of the bob-tailed horse car and for many years thereafter passengers entered and left the car at the rear end. Use of the rear end of the car for both entrance and exit of passengers, however, created some confusion and congestion as loads increased.

Typical old-fashioned heavy interurban car

Modern light-weight interurban car

Just when the practice began of having passengers enter at the rear and leave at the front is difficult to determine. This arrangement appears to have been used to a limited extent before the introduction of pay-as-you-enter operation. The latter, however, did much to popularize it. While many pay-as-you-enter cars provided for passengers to leave at either end, efforts were made to encourage the continuous movement of passengers through the car by having them board at the rear and leave at the front. This reduced the tendency to overcrowd the rear of the car.

Recent type of high-speed interurban car

Numerous modifications of the original pay-as-you-enter plan have been made in recent years, with consequent changes in door and platform arrangement. Three general plans of door arrangement have been widely used with both single-end and double-end cars. These are (1) doors at both ends; (2) doors at front and center but not at rear, and (3) doors at front end only. The methods of utilizing these doors for entrance and exit depend largely on whether the car is operated by one man or two, and also on the individual preference of the management, the prevailing idea being to avoid confusion and delay by separating the boarding and alighting passengers.

The idea of a door in the center of the side of the car is by no means a recent development. Only a few years after the beginning of electric operation of street cars several companies tried the experiment of joining two short car bodies together into one large unit with a center door. At various times in the history of the industry other center-door cars have been built. In general, however, it has not been found satisfactory to have center doors only, on account of the interference of boarding and alighting passengers already mentioned in connection with the rear-door-only arrangement. Combination of front and center doors, however, have worked out well in many instances. An interesting variation of this design is a car recently developed in Chicago with front, center and rear doors all on the same side.

Not long after the adoption of the rear-entrance front-exit design, a new type of vehicle was brought out in Philadelphia, called the "near-side" car. This was a single-end car with a large double door at the front end. The conductor had a railed-off space in which he was stationed just behind the motorman. Passengers boarded the car through one half of the double door and left through the other half. In recent years this same general plan has been widely used in one-man operation.

An important development following the "near-side" car was the Peter Witt car. In this design the front door continued to be used for entrance, but a center door was used for exit with the conductor placed alongside this center door. Cars with this door arrangement have also been used for center entrance, front exit.

The extension of one-man operation in late years, with both entrance and exit at the front end, re-created in some measure the old problem of conflict of boarding and alighting passengers. To meet this situation the automatic rear exit was evolved so that the weight of a passenger standing on a treadle plate causes the rear door to open after the car has been brought to a standstill. Many recent one-man cars have been equipped with this device.

Interurban cars have generally followed through the same stages of development as the city cars, except that of accommodating large crowds, and since stops are relatively infrequent the saving of fractions of seconds is a matter of less importance. Hence the end-door designs have continued to be favored over those with center doors. Where interurbans are operated with one man the system of having both entrance and exit at the front has generally been favored.

Design of rapid transit cars at first followed closely along the lines of steam railroad practice. As the crowds to be handled became greater, center doors were introduced in addition to those at the ends. More recently the end doors have been eliminated and three or four doors have been provided, spaced evenly along the side of the car.

From the structural point of view the changes in car design have been extensive. As the power of a team of horses determined the weight that could be

Modern heavy interurban multiple-unit train hauled, the horse cars were built as lightly as they could be made without falling apart. Framing was always of wood, which was the lightest and most easily fabricated material available. The body was built upon the platform constituting the floor framing, which also had to be made strong enough to hold the running gear. The car platforms were added as separate units and contributed practically nothing to the strength. Side panels and roof ordinarily were made of three-ply veneer on account of its lightness.

With the introduction of electric power came faster acceleration and braking rates, as well as higher speeds, but in return the weight limitation was removed. Heavier framing was adopted to withstand the added strains, but the same general design was followed as in the horse cars. However, the practice was introduced of cutting through the roof framing to insert a monitor deck. While this was considered advantageous for light and ventilation it weakened the structure materially.

Steel framing first came into use in the subway cars of the New York Interborough system. This construction was undertaken when it was decided that inflammable wooden construction was too dangerous for use underground. In those cars the principle was adopted of designing the car structure as a whole, making each member do its part in contributing to the strength. The top sills formed girders from which a considerable portion of the weight of the body was hung, and the underframe was lightened correspondingly. Platforms were made integral with the body, so that they were a source of strength rather than an added burden to be carried by the body framing. The success of these cars created a demand for steel construction in street car service, but design had not progressed sufficiently that steel cars could be built as light as wooden cars. Weights crept up steadily, increasing the power demand and causing added wear on tracks.

A reversal in the weight trend came with the design of the original Birney car, brought out in 1916, and in its successors. The arch roof came back to supersede the monitor roof, permitting continuous window posts and carlines, stiffening the body and reducing weight. Ventilation was taken care of by mechanical devices. Present trends in body design are toward the use of steel framing, with a certain amount of wood for fillers and trim. This reduces noise and makes the assembly of the body somewhat easier without any material effect on the weight.

Within the past few years considerable attention has been given to weight reduction, both in car bodies and in trucks. This has been done both on account of the expense of hauling dead weight around and in order to provide a simple means of getting faster acceleration and higher speeds even with small motors. One of the most promising methods is through the use of lighter materials, chiefly the strong alloys of aluminum that have been developed recently. By the use of these alloys the weight of a member of given cross-section can be reduced to one-half or less that of steel with no loss of strength.

One of the most notable improvements in car design has come within comparatively recent years. For a long time there was not much change in the exterior appearance of the ordinary rail vehicle. The introduction of completely closed platforms together with the substitution of an arch roof for the old-fashioned monitor deck gave the car a more compact appearance. Following this the car builders began to give greater attention to the alignment of windows, doors, etc., to secure a streamline effect. This development was further stimulated by the introduction of the so-called automotive type car first brought out at Springfield, Mass., in 1927. Since then, constant effort has been made to secure graceful proportions and pleasing appearance. While it cannot perhaps be said that the modern electric car is a thing of great beauty it is at least a neat, trim, business-like looking vehicle, far more attractive in appearance than its forerunners of a generation ago.

Originally the horse car was merely a shell with seats for passengers and a place for the driver. With electrification of street railways, motors and control were added to the car equipment. Then in turn various devices were introduced to assist the crew in their work. These included air brakes, sanders, mechanically-operated doors and steps, fare boxes and registers, energy-saving devices and the like. With the advent of one-man operation came safety control, automatic interlocking of doors, treadle release, and many other devices that have tended to make car operation more efficient and that add to the safety, comfort and convenience of the passenger.

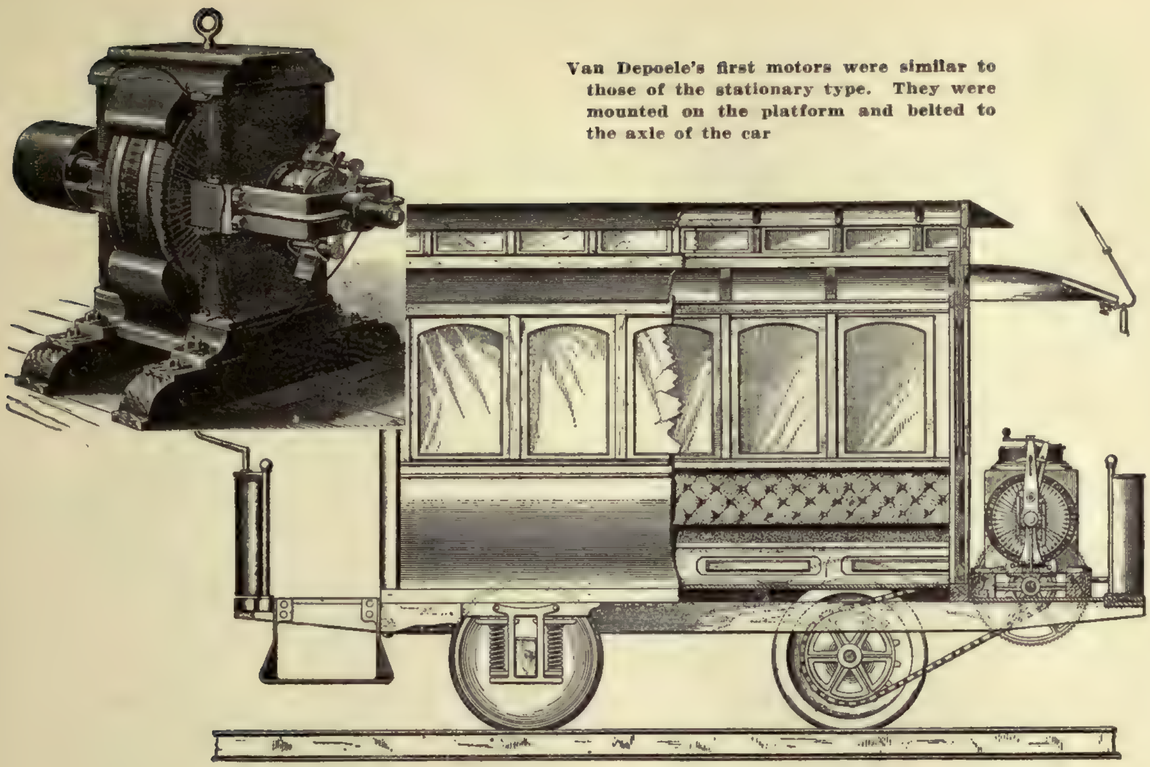
From the standpoint of the passenger, the seats, lights, heat, ventilation, etc., are of greater interest than the structural features of the car. To trace all of the many steps in the evolution of these details, however, is beyond the scope of this article. The old carpet-covered longitudinal bench has been transformed into the deep-cushioned leather-upholstered individual seat. The old dim oil-burning lamps have been superseded by electric lights, unshaded bulbs at first and now the attractive dome fixtures. Straw scattered over the floor was once the only means of keeping the passengers' feet warm in cold weather. Coal-burning stoves were a great improvement when they were first introduced on the cars, but even they have now to a large extent given way to electric heat. Where ventilation was once secured simply by opening the windows, it is now arranged through such effective ventilating apparatus that the condition of the air in the average car can be made as good as in one's own home.

Much attention has been directed toward reduction of noise in operation, particularly that part which can be traced to elements in the car. Padding and sound-deadening materials in sides and roof, as well as various types of flooring, have been effective in preventing sounding-board effects. Electrical equipment and brakes have been so constructed as to eliminate noise. Motor gears, which have been a frequent offender in the past, have been quieted by the addition of lead inserts of steel rings welded on. Wheels have been fitted with wooden, rubber or lead plugs that break up resonance. More care has been taken to eliminate from the design parts that are likely to come loose and rattle. Special attention has been paid to designing the car so that, in addition to being quiet when built, it will remain so throughout its life if given ordinary care in maintenance.

Notable Improvements in Exterior and Interior Appearance

Early cars were notable for rather ornate decoration both inside and outside. Present practice tends more toward simplicity, but the ultimate effect of the modern method of decorating is undoubtedly more attractive than was the old. Moreover, the elimination of ropes, straps and contraptions of various kinds has greatly increased the attractiveness of the car interior. The introduction of appropriate floor coverings has greatly improved the appearance. All these things have resulted in making the modern car more comfortable and attractive in the same manner that improvement in structural design has made it more efficient.

Looking back broadly over the history of car design during the past century it will be seen that there have been few sudden and radical changes. Progress has been made step by step as one detail after another has been redesigned and improved. The advances made during this period in structural design have been of far-reaching importance, but no more so than those which have added to the comfort and convenience of the passenger. Progress in car design has reflected accurately the steadily rising standard of electric railway service. The perfect car has not yet been evolved, nor is there any likelihood that it will be, but improvement has been rapid in recent years and attention is being focused on this subject to a greater extent today than ever before. As a result we may confidently expect to see a continued improvement in car design that will keep pace with the exacting demands of the riding public.



Van Depoele's first motors were similar to those of the stationary type. They were mounted on the platform and belted to the axle of the car

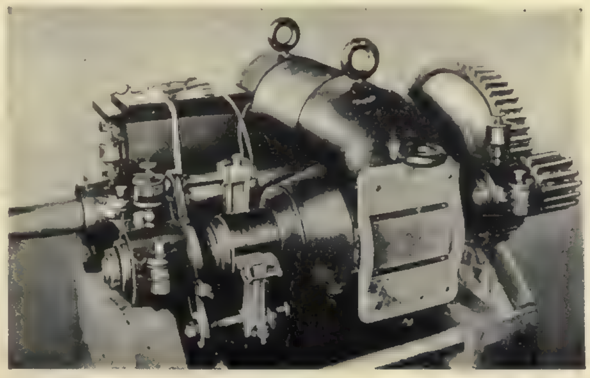
CONTINUOUS PROGRESS

Has Characterized

Motors *and* Control

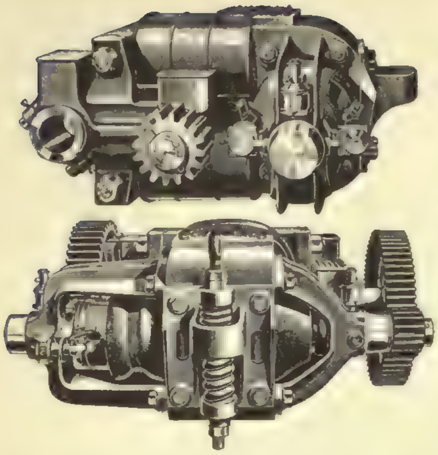
EVEN in its infancy, the electric motor stood out as a giant in the transportation industry. Sturdier and more adaptable than other motive powers, it soon displaced them and completely dominated the field. For half a century it has held its place as the most satisfactory means of drive. While steady progress in motor design has taken place throughout this 50-year span, the developments in the last five years have done more to improve the railway motor than those made in any comparable period since the experiments of the pioneers that led to stabilized types. Still further revisions that will make for better performance under the changing conditions ahead are likely. Similar progress has been made in methods of control and in control equipment. These have done much to assist the motor in doing its best under all conditions of service.

Most significant is the gain in output per unit of volume and per unit of weight that has taken place. For instance, a 35-hp. motor of 30 years ago weighed just short of 2,000 lb. A standard 35-hp. motor of today that weighs approximately 1,300 lb., or less than two-thirds as much, not only has better electrical performance, but actually has a greater continuous capacity. Even lower weights have been attained by some special high-speed motors of this same rating. Dimensions have shrunk along with the weight, so that the new motors are far more adaptable and permit the design of new types of drive previously unthought of. Better acceleration and higher speeds are natural results of these major improvements in the street railway motor.



One of the earliest Thomson-Houston motors. It was almost identical with the generators of the same make, but was turned on one side and fitted with double-reduction gearing

Greater appreciation of the progress that has been made in motor design will be had from a brief review of the steps that have taken place since it first was realized that electricity is



Sprague's motor used on the Richmond road was a distinct improvement over previous types. Originally designed for single reduction, a change to double-reduction gearing was later found necessary

an ideal source of power for the propulsion of vehicles.

History of the electric railway motor can be divided readily into four distinct periods:

1. Experimental—Prior to 1888
2. Development—1888-1895
2. Refinement—1895-1925
4. Revision—1925-

During the experimental period, the main purpose was to prove that electric propulsion was feasible. The history of the electric motor goes back nearly a century, for in 1835 Thomas Davenport, a blacksmith of Brandon, Vt., conceived the idea of using an electric motor for driving machinery. He obtained fundamental patents in 1837 on the use of the motor for propulsion. Had his work been followed up, these would have been extremely valuable, but it was ten years before any further development took place. Moses G. Farmer in 1847 built a model electric locomotive which was exhibited in Boston, and in 1851 Prof. C. G. Page built a car which actually made a successful trip on a railroad track.

INVENTION OF DYNAMO WAS AN ESSENTIAL STEP

All the early attempts were doomed to failure, since the only source of electric power was the chemical battery, high in cost and expensive to operate. It was not until the "reversibility" of the dynamo pointed the way to an adequate source of power that further experimental work was practicable. In fact, it was in 1878, ten years after the discovery of this principle, that Stephen D. Field experimented with electric motors for driving a car. To him the Patent Office awarded prior rights on his inventions. In 1881 he exhibited a locomotive which had a bipolar motor with a longitudinal shaft. This drove a countershaft though a bevel gear, the countershaft being spur-geared to the axle. The direction of motion was reversed by changing the brush position.

Early motors were mounted inside the car body or on the platform. Bentley and Knight in the equipment of their Cleveland road in 1884 were the first to place the motor under the car floor. It drove the axle by means of coiled wire ropes, which later were replaced by friction wheels and bevel gears. Their motor also was the first to use a series connection of field and armature. Other designers followed similar lines, using various methods of drive. In the Baltimore installation of 1885 Daft used compound-wound motors with a single-reduction drive by means of an internal gear. Some of the later Daft roads employed double-reduction gears, since the armature speeds were too high for a single reduction.

Frank J. Sprague in 1886 developed the method of supporting one end of the motor on the axle and the other on the truck, the method which is in general use today. This motor had single-reduction gearing.

Bentley and Knight a year later brough out a motor with double-reduction spur gears protected by inclosure in a gear case. Another innovation was the use of brackets made a part of the motor frame, on which were carried the bearings and brush holders. The motors were series wound, and were connected in parallel on the circuit.

MANY INNOVATIONS ON RICHMOND ROAD

Equipment of the Richmond road in 1888 by Sprague, which was the largest installation up to the time, saw a number of changes in practice. Two series motors per car were used. They were bipolar with axle suspension. Originally the motors had single-reduction gearing, but when it was found too light the motors were redesigned and double-reduction gears substituted. The motor fields were wound in sections, and the control was effective in part by varying the number of field turns. As in earlier motors, copper brushes were employed.

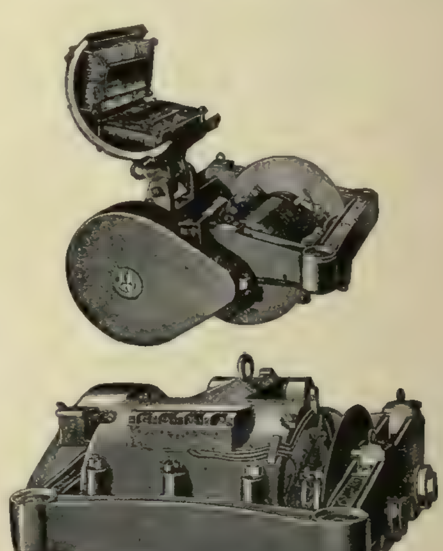
When the Thomson-Houston Company entered the field in 1888, it advertised the combination of practically all the improvements that had been made up to that time. Two motors were placed on a specially designed truck independent of the car body, the drive being with double-reduction spur gearing. The field was made of iron forgings. A series field winding was used with external resistance control. At the suggestion of Van Depoele, carbon brushes replaced the copper brushes, previously used almost universally.

By this time, all the essential elements for a practical railway motor had been developed. However, the design was still very crude and much development work was necessary before the street railway could be considered a commercial success. C. O. Mailloux in 1890 brought out a motor for use on a storage battery system that was a distinct step in adding ruggedness and reliability. It had a four-pole field, while slotted laminations with coils placed in the slots replaced the smooth core with the armature conductors on the surface as in earlier designs. The commutator was cross-connected so that one pair of brushes could be used. Later motors built by Mailloux used wave-wound armatures for the same purpose.

BEGINNINGS OF THE IRON-CLAD MOTOR

About the same time the Westinghouse Company brought out its first railway motor, which was followed the next year by its No. 3 motor. These motors were distinguished by the cradle in which the fields were carried, and which formed a shield for the motor, as well as a support for the armature bearings and bearings for carrying the motor itself on the axle and the truck frame. The motor had four salient poles placed at a 45-deg. angle, and the field frame was split in a horizontal plane to facilitate inspection and removal of the armature. The armature was slotted, and in the No. 3 motor formed coils were used instead of the hand-wound coils of earlier types. The motor was partially open, but the frame around it gave some protection to the armature and commutator.

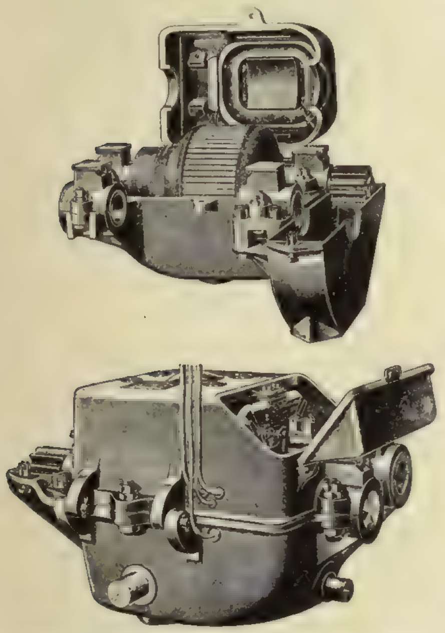
Inclosure of the field frame was seen first in the WP-30 motor, placed on the market by the Thomson-Houston Company in 1891. This was a bipolar motor with only one field coil, placed at the top of the case. The magnetic circuit was formed of a partially closed case



The first motor to use a magnetic frame completely surrounding the armature was the Westinghouse No. 3. It had form-wound coils

which surrounded the armature. This case was cast of mitis iron in halves, the lower part being arranged to drop.

Gearless motors were tried by several manufacturers, but were found unsatisfactory and were abandoned. The armature speed was necessarily so slow that a good design was practically impossible, and the support of the armature to provide a reasonable amount of springing was an almost insurmountable obstacle. In more recent years gearless motors have been used on some high-speed locomotives where small-diameter driving wheels are permissible.



With the formation of the General Electric Company in 1892, the GE-800 was brought out. This was totally inclosed

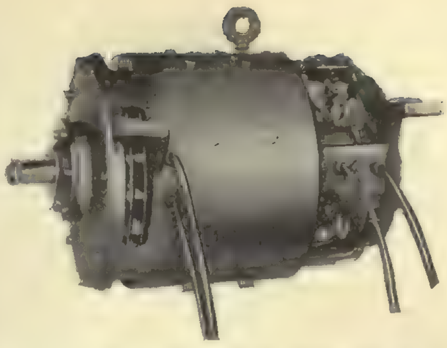
All Essentials Worked Out by 1893

In 1892 the Thomson-Houston, Edison, Sprague, Brush, Sperry and Short interests were combined to form the General Electric Company, and the earlier lines of motors manufactured by these concerns were abandoned, being superseded by a line of which the GE-800 was typical. These motors embodied most of the good features of their predecessors, but had two salient and two consequent poles, so that their performance was not entirely satisfactory. In 1895 they were replaced by a new line, of which the GE-57 was the earliest. About the same time the Westinghouse Company brought out the 12-A motor. These two lines were typical of the revised design which embodied every essential for successful operation, and which continued practically standard for many years. The characteristics of these lines may be summed up as follows:

1. Series connection of field and armature, giving high starting torque and rapid increase of speed.
2. Frame made of steel castings of a shape to surround and protect the interior of the motor.
3. Armature core made of slotted punchings, and coils wound and insulated before inserting.
4. Wave-wound armature acting in a field with four salient poles, with a single pair of brushes.
5. Carbon brushes set midway between the poles, and not shifted in position when reversing direction.
6. Single-reduction spur gearing between armature and axle, with armature speeds of 500 to 1,000 r.p.m., and gear reductions between about 5:1 and 2:1.
7. Gears inclosed in a malleable iron case containing a supply of lubricant.

Several other American electrical manufacturers brought out competitive motors in the decade that followed, but none of them showed any marked superiority over the lines brought out by the two large companies, which made consistent improvements from time to time, although there were but few radical changes. The split frame which was a feature of the earlier motors gave way to a solid frame, since with increased reliability the need for changing armatures was reduced, and it was found more satisfactory to run the truck out from under the car and remove the motor as a whole when making repairs. The poles were made of laminated steel, bolted into the motor case in order to make the magnetic circuit more uniform. Both field and armature coils were improved by changes in shape, better types of insulation, and the use of strap or square wire coils where needed to give capacity. New methods of dipping and baking so as to impregnate the windings with insulating material increased the life of these parts greatly. Better commutator design, uniformity in the dimensions of bars and mica, and selection of better grades of mica, as well as correct dimensions and material of brushes improved commutation.

Introduction of Interpoles an Outstanding Step

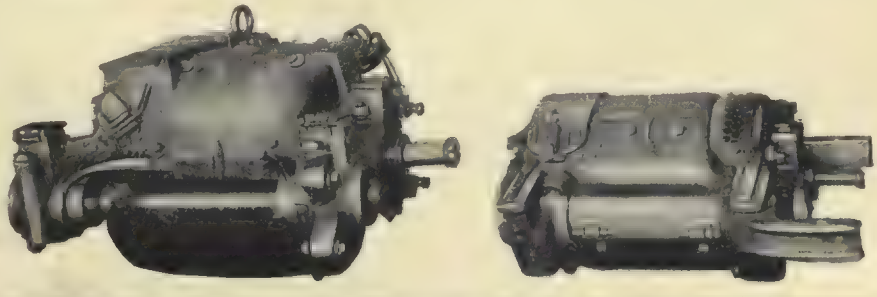


For the newer drives motor dimensions have been reduced to the limit. The GE-1126 automotive-type motor is an example of this development

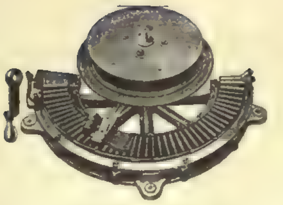
Probably the outstanding development of the refinement period was the introduction of the interpole about 1905. This change was the addition of a set of poles placed between the main poles and carrying windings in series with the armature, the number of ampere turns being approximately equal to and opposing the armature ampere turns. This reduced the distortion of the main field flux to a negligible quantity and permitted sparkless commutation at any load or speed, or in either direction of motion, without any change in the brush position. Although the current density in the brushes is raised, there is less heating of the commutator and very small brush wear. Commutator wear is almost nothing. Introduction of the interpole also has made feasible the use of voltages higher than the conventional 600 which has been used for many years in street car work.

Ventilation Increases Motor Capacity

For years motors were built totally inclosed. On account of clearances they could not be made absolutely waterproof, but would withstand splashing, and some motors even would submit to operation through a flooded street without taking in an appreciable amount of water. However, it was seen that the continuous capacity could be increased materially by opening the case and forcing the circulation of external air throught the fields and armatures. Accordingly, the manufacturers placed fans on the armature to cause a current of air through the case. This change has permitted a considerable reduction in weight for a given rating, and an even greater gain in continuous capacity. In some motors, particularly for heavy traction work, reliance is not placed alone on armature fans, but air is sup-



The Westinghouse No. 12-A motor, shown at the left, was the first motor to incorporate the essential features that have since bcome standard. In comparison is seen the same company's No. 508 motor, which is a modern machine having the same rating



Early controllers were simple resistance switches. This type manufactured by the Thomson-Houston Company is a good example

plied to the motor by means of a flexible tube from an external blower system. This permits a further increase in rating, as the circulation of air is not dependent on the movement of the armature.

Grease lubrication, which, while not entirely reliable, was standard for many years on account of its simplicity, has been supplanted by oil, ordinarily supplied to the bearing surface through a wool waste wick. In some recent bearings the oil is contained in a sealed well, and inspection and replacement are necessary only at infrequent intervals. Many of the smaller motors now are built with ball or roller bearings.

When a campaign was made a number of years ago for a material reduction in car weights, along with lower step heights, it was found that this would not be possible with slow-speed motors of conventional design, which, in general, required wheels of 30 to 33-in. diameter for sufficient clearance. The manufacturers met the demand by bringing out entirely new lines of motors suitable for the modern cars. The principal change resulting in weight reduction was an increase in armature speed. Improvements in gearing have made practicable the employment of far greater speed reductions than had been the custom. Improvements in design and in the ventilation system have made it practicable to reduce the weight of the motor even more than in the inverse ratio of the speed. Methods of suspension in which the entire motor weight is spring borne have been of assistance on account of reducing road shocks and permitting smaller clearances in the motors.

Greater Weight Reductions Forecast in Future

Undoubtedly, the future will see still greater weight reductions. It is possible to make the motor magnetic circuit of rolled steel of high permeability instead of cast steel. Light-weight alloys can be used for non-magnetic parts. Higher armature speeds are by no means out of the question. There is a growing school of advocates of the shunt and compound-wound types of motor, which also have possibilities for weight reduction.

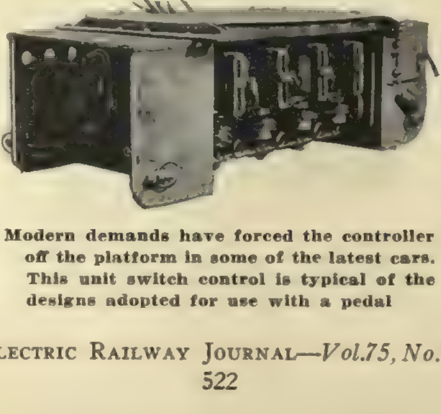
Contemporary with the development of the street car motor, there has been a like change in motors for heavy traction. It is not possible to follow the design through in a similar manner, since there has been such a diversity of systems of supply, of requirements and of individual characteristics of design that there has been no standard for comparison. There has, however, been a parallel improvement from the crude beginnings, and similar innovations have been made in the various types of heavy-traction motors.

Control Developments Are Equally Striking

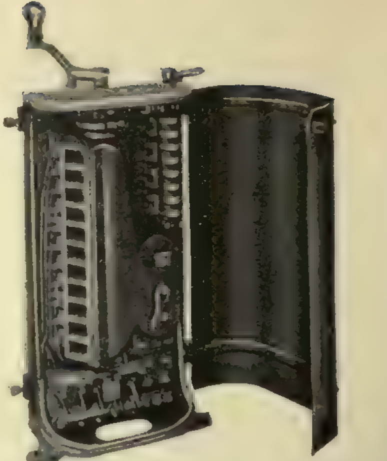
Control methods and controllers have undergone a development not less striking than that of the railway motor itself. The first controllers were merely hand-operated switches for throwing the power on and off. It soon was seen that better regulation was necessary, both for the safety of the car and for the protection of the generating equipment. With the acceptance of the series-wound motor, the insertion of series resistance, cut out in steps as the motor gained speed, became the custom for control. Various forms of resistance were used, of which sheet iron and cast iron were the most popular.

In some installations, notably those by Sprague, the field windings were divided into sections which were inserted or cut out to vary the resistance of the circuit and at the same time the number of ampere turns of the field. With the crude motor designs of that day, the performance with weakened field was found unsatisfactory and the method was abandoned.

Probably the outstanding development in the control of electric railway motors was the invention of the series-parallel system, which was brought out by the Thomson-Houston Company in 1892. With this the two motors are placed in series at starting or for slow speed, and then reconnected in parallel for high speed. Suitable resistances in series are used for further control of the speed. This method has become universal for use with direct-current series motors, the principal differences between the several types of control being in the method adopted for transition between the series and the parallel connections. The chief advantages of this control are that it is much more efficient, reducing the waste of energy during acceleration, that it requires less expensive equipment for controlling the acceleration, and that it provides two economical operating speeds.



Modern demands have forced the controller off the platform in some of the latest cars. This unit switch control is typical of the designs adopted for use with a pedal



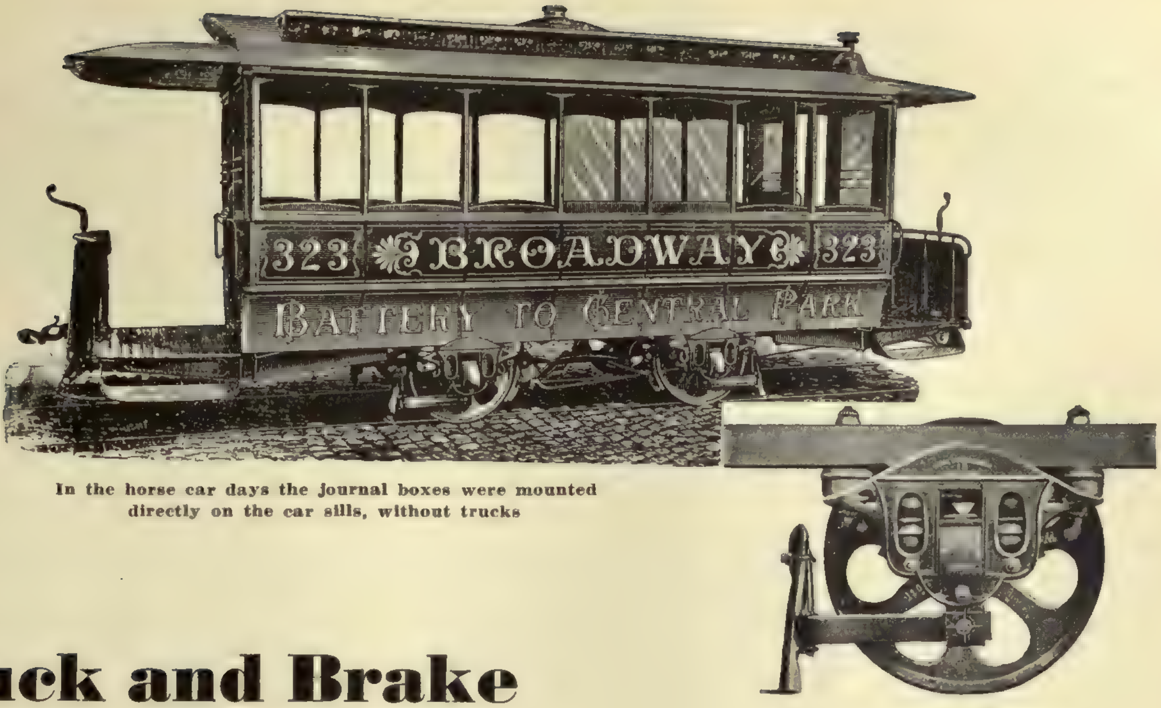
From its inception, the Type K controller was a success. With various modifications, it is still the standard where platform control is used

Drum Switch Adopted as Standard

Various types of controllers have been used, but many years ago the drum switch was adopted and has been the standard ever since. In this type the circuits terminate in fingers which press on conducting segments mounted on an insulating drum which makes the proper connections between the fingers to establish the desired circuits. The Type K controller, which was brought out as one of the first series-parallel controllers, has been modified to handle the circuits of street railway motors of various sizes, and with several modifications of the plain series-parallel connection. In these modified forms, its use has been almost universal where a platform controller is desired.

For some of the heavier equipments, as for rapid transit and interurban service, particularly where several cars are controlled from one position, remote control has been developed. The first control of the multiple-unit type, invented by Frank J. Sprague for use on the Chicago elevated lines, consisted essentially of a modified Type K controller mounted beneath the car and driven by a small pilot motor, which in turn was controlled by the motorman. Later types of remote control substituted individual switches instead of the drum, and they were opened and closed either directly by electro-magnets or by air pistons controlled by electro-magnets. All multiple-unit controllers embody these general features.

One of the recent developments is the adaptation of multiple-unit control for single cars, the master control being through a pedal. The operator thus is able to adjust the speed at his convenience through the pressure of his foot.



In the horse car days the journal boxes were mounted directly on the car sills, without trucks

Truck and Brake History

Shows Radical Developments

By

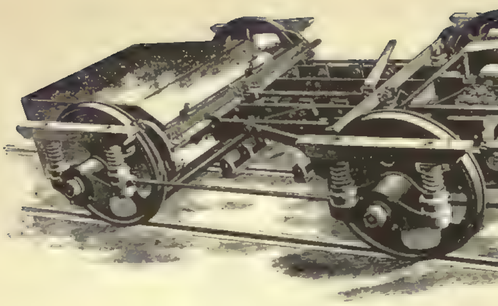
MORRIS BUCK
Engineering Editor
Electric Railway Journal

EARLY horse cars followed the design of the stage coach. Naturally the running gear consisted of loose wheels revolving on fixed axles attached to the car body. Before long it was found advantageous to reverse this practice, and the plan was adopted of having a pair of wheels pressed or keyed rigidly on a long axle which revolved in journal boxes. With track curves of moderate radius this plan was quite successful, and it has been continued ever since. It made possible a better form of bearing and permitted the journal box to be spring supported in a pedestal. At first it was customary to mount the pedestals rigidly on the car framing, so that the only movement permitted was vertical play against the springs. So far as can be ascertained all the early horse cars used axle bearings that were bolted to the wooden side sills. This made for a simple structure and, with the wheels acting as trailers only, no particular difficulty was encountered in keeping the axles in alignment.

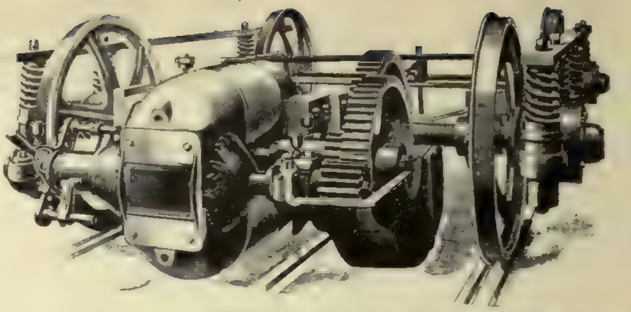
The early electric railway designers mounted the propulsion motors on the platforms. Since this method soon proved impracticable, they were mounted on the axles, usually on existing horse cars. Very soon it was found that with the removal of the limitations which the ability of the horse had imposed on car weight and speed, the running gear was entirely inadequate for the more powerful vehicle. Accordingly, about 1888, representative car builders brought out designs in which the running gear was assembled into an independent structure. The leaders in this movement were Bentley and Knight, who had also been pioneers in the installation of the earliest electric railways. One type of truck was designed with a rectangular frame which extended entirely around the top, and which was intended to keep the car body in alignment, strengthen it and prevent too much lateral motion.

Later, it was found necessary to spring-support the frame. The axle box support was at first suspended from the under side of the journal box, and cushioned with rubber at the point of connection with the box. Practice showed that it was necessary to have the wheels and axles removable without disturbing the axle box frame, springs and other parts of the running gear. The design was then modified so that the frame would be supported over the journal boxes and cushioned at the top.

Soon it was found desirable to devise some means of overcoming longitudinal pitching motion. This was accomplished by placing elliptic or semi-elliptic springs at the four corners of the truck. Many designs of single trucks have been developed, but they all have to meet the requirement of turning around sharp curves with the four wheels mounted on two parallel axles. Since the distance traveled by the inner and outer wheels is different, there must be slipping. Also, with the axles parallel, there always is a tendency for the wheel flanges to climb over the rail head and derail the car. These difficulties have restricted the general use of a single truck to cars of not more than about 30 ft. over-all length and a total weight of some 20,000 lb. The maximum wheelbase is usually between 8 ft. and 9 ft. In most designs, the side frames extend a considerable distance beyond the wheel line at each end to form a support for the springs.



One of the early separate trucks, brought out by Bentley and Knight in 1888. The journal boxes have short beams for attachment to the car sills



A modification of the Bentley-Knight truck, brought out soon after the previous one, had side bars tying the axles together to maintain spacing independently of the body

Numerous attempts have been made to overcome the inherent disavantages of the single truck. The most usual is to permit the axles to swing in such a manner that they will take a radial position when the car goes around curves. The Radiax truck is perhaps the best example of this. A swing link suspension, with two pins at the lower end of each hanger, carries the journal boxes and allows some longitudinal movement of the axles, but tends to return them to parallelism as soon as the car is on straight track.

Other plans involve the use of wheels mounted in a manner similar to the front wheels of an automobile, the axle being rigid and the wheel hub free to turn through a small angle. While none of the plans so far brought out has been entirely successful, the field existing for a small four-wheel car makes the problem interesting for the designer.

A more pretentious attempt to overcome the limitations of the single truck was the Robinson radial truck, brought out in 1890. This arrangement consisted of three single-axle carriages articulated together. The end carriages supported the car body through swivel bearings, while the middle one, which was free from any pivotal connection with the car body, would at all times keep its axle perpendicular to the track rails. The passage of the car around a curve, by swinging the middle axle out of line, turned the outside axles to a radial position. While the truck accomplished its purpose, its complications were so great that it never was widely accepted as a solution of the running gear problem.

Mounting of a car on two swiveling four-wheel trucks was adopted by steam railroads in early days to obviate the disadvantages of the single truck. At various times they were used on horse cars where conditions demanded the use of long cars. Within relatively few years after the advent of electric traction, about the beginning of the present century, employment of two swiveling trucks became fairly common on street cars. While the wheel loads and car dimensions are not great enough to demand the use of eight wheels for purely structural reasons, the superior riding qualities, ease of negotiating curves, and possibilities of higher speeds have caused the single truck to all but disappear from American street car lines.

This early Brill truck represents a further development. The framing is more rigid and the journal boxes are carried in guides

Early double trucks were merely steam railroad trucks with provision for mounting of electric motors. It soon was found that they were not sufficiently flexible to make for easy riding on rough track, and designers attacked the problem of obtaining a more flexible support for the car body. As a result, a number of types were brought out.

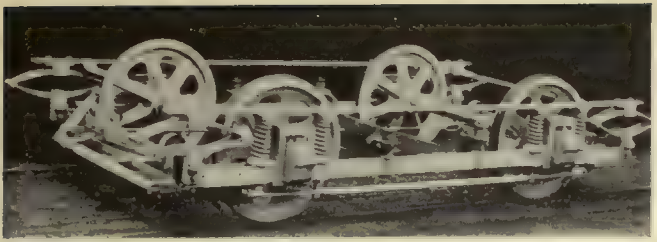
Support of the bolster, or cross-member to which the car body is attached through a center bearing and a king bolt, can be arranged in a number of ways. The simplest is to fasten it directly to the side frames so that they form one integral unit. This practically duplicates the arrangement used on the single truck. Cushioning of the support is then entirely through the springs carrying the weight on the journal boxes. These springs may be elliptical or helical, or a combination of the two. In any event, the spring action is confined to absorbing vertical play of the axles, and there is no compensation for swaying of the superstructure. The rigid bolster truck was suitable for slow speeds, principally for freight motor cars and locomotives.

The floating bolster, which was adapted from steam railroad practice, is mounted on elliptic springs which rest on the side frames of the truck. It has an independent vertical movement and travels in ways in the side frames. This type of construction, which had long been standard for steam railroad freight cars, was adopted for electric cars fifteen years ago to obtain an extremely low over-all height in order to lower the car floor and eliminate a step. While it is not suited to high-speed work, the arch-bar truck has been quite successful in city service.

Best results in high-speed service with any of the conventional types of truck are obtained with the swinging bolster. Here the bolster travels in a guide or transom, and is mounted on elliptic springs. Unlike the floating bolster, the springs do not rest directly on the side frames, but are carried in a saddle hung from the transom, so that opportunity exists for a side swing of the superstructure. Various auxiliary spring systems have been devised to increase the flexibility still further. Trucks of this type have been used for all classes of high-speed passenger service. Since a certain amount of height is necessary to gain flexibility in a truck of this type, it is somewhat difficult to adapt it for use under extremely low-floor cars.

Since the two trucks of a car may be mounted any distance apart, there is no practical limit on length of body that can be supported. Overhang on curves is the greatest limitation, and this can be minimized by mounting the trucks a considerable distance from the ends of the body. The wheelbase of the truck itself must, however, be kept short enough so that the car can negotiate curves of the minimum radius encountered. This may cause difficulties in the mounting of motors and brake rigging. Ordinarily, the motors are placed between the axles, but by placing them outside the axles the wheelbase can be reduced materially. The maximum allowable wheelbase is seldom more than 7 ft.

Efforts have been made in recent years to design trucks which will eliminate the principal disadvantages of standard types. Requirements of today call for high speeds and high rates of ac-



A somewhat more recent single truck with elliptic springs inserted to reduce oscillations of the car body

The maximum traction truck was a favorite when two-motor equipments were popular

celeration and braking. Smoother riding and quietness are demanded to meet the competition of the automobile. Ease of access is also essential, calling for low step height, with the ultimate desire to eliminate steps altogether. But above all there has been an insistent demand for weight reduction. This is an essential factor in attaining most of the other requirements. Light weight means reduced power demand, which in turn makes possible smaller motors. Again, it permits reduced dimensions, and makes possible changes in body construction that otherwise would be out of the question.

One of the earliest devices to overcome the objections to the standard double truck was the maximum traction truck, brought out by the J. G. Brill Company in 1891. The distinguishing feature of this truck was that one axle carried standard 30-in. wheels, while the other had wheels of a considerably smaller diameter, usually about 22 in. The center bearing was offset so that between 60 per cent and 75 per cent of the total car weight was carried by the large wheels. It was used with a two-motor equipment, one motor per truck, the weight of the motor adding to the portion of the body weight carried through the center bearing. Use of the maximum traction truck permitted a saving in height of as much as 10 in., and it was claimed that one step could be eliminated through it. The principal difficulty was that, due to the unequal distribution of weight, there was a tendency of the small wheels to derail. The maximum traction truck was entirely unsuited to high speeds, and, of course, the possible adhesive weight, even with the offset center bearing, was materially less than with the standard trucks with equal diameter wheels and four motors per car.

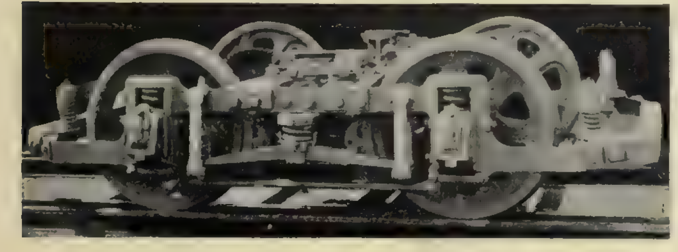
Since the early days of electric railways the propulsion motors have been hung from the axles on bearings which are made integral with the motor case. This arrangement serves to align the driving pinion of the motor with the driven gear on the car axle. Thus mounted, the motor is free to rotate around the car axle. It is restrained by means of a bar or other member connected to the side of the motor case opposite the axle, and held to the side frame or end frame of the truck through springs. Approximately half the motor weight is thus carried directly on the axle, and its weight is transferred to the track through the wheels without the medium of springs. With increased weights of motors the resultant pounding became increasingly destructive.

In recent years it has become standard practice to use two motors on each truck, one to an axle. By this means, the maximum unsprung weight on any axle is only slightly more than one-half of what it is with a single motor per truck. Progress in motor design has made it possible to obtain practically as good efficiency with four motors per car as with two. Naturally, it has resulted in lighter members of the truck and has permitted the use of smaller axles, bearings and other parts. Less power transmitted per axle has made it possible to use smaller gears and higher reductions, so that the motor speeds have been increased and weights reduced correspondingly.

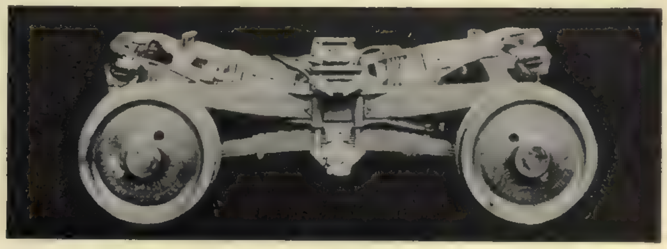
With all these changes there still has been a demand for trucks of even better performance. Manufacturers have met this in a number of different ways. Some have followed along conventional lines, but in general the changes have been radical. One of the most successful has been the abandonment of spur gearing and the subsitution of worm drive. With this the motor speed can be as high as is desirable from the electrical standpoint. Longitudinal mounting of the motor has removed the limitation to its length imposed by placing it between the wheels, and also has made it possible to extend the motor shaft to any desired length. Development of the worm drive principle has been carried out by the Timken-Detroit Axle Company, and a number of designs have been made by that company to incorporate improvements from time to time as experience has shown them desirable.

Less radical changes have been made by the J. G. Brill Company and the St. Louis Car Company in modifications of the swinging bolster type of truck to adapt it for high-speed motors under low-floor cars. This has necessitated a change in the arrangement of the swinging links to give them sufficient length for flexibility of the truck. Additional springs have also been included for easy riding. Motor drives with these trucks include a single-reduction spur-geared motor, mounted so that practically its entire weight is carried free from the axles. Another type is a worm gearing in which the motors are mounted outside the axles, with long drive shafts connecting them to the opposite axles. Still another arrangement is the W-N drive, which reverts to the double-reduction gearing, but with the difference that the motor is swung entirely free of the axle. A recent truck of the Cincinnati Car Corporation employs a modified form of arch-bar truck to accomplish the same purpose of providing flexibility of motor mounting.

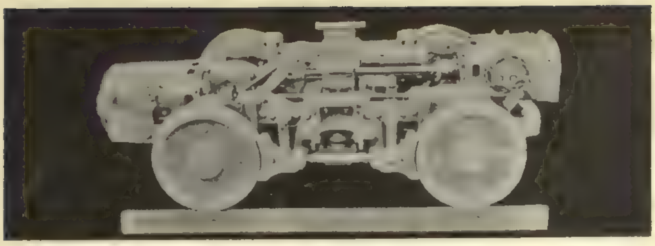
Development of braking methods followed naturally along with the changes and improvements in motive power. Hand-brake rigging had been standardized for steam cars and horse cars for many years before the days of electric motors. With the higher speeds and greater loads of the electric cars, it soon was found that the existing brakes were inadequate. Originally, brakes were supported from movable points, subject to the action of the car



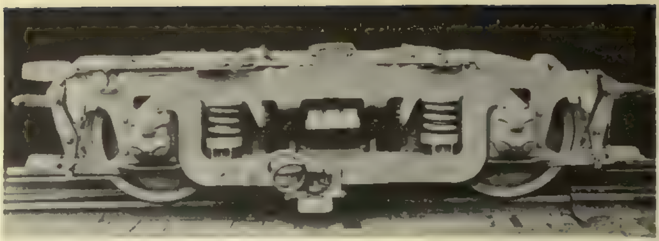
A standard short-wheelbase truck of the swinging bolster type of recent design



One of the recent Timken worm-drive trucks. Structurally it is a modification of the arch-bar type



An adaptation of the swinging bolster truck to worm drive. Individual brake cylinder and drive for each truck are used



One of the newer trucks of the arch-bar type, arranged for double-reduction drive

springs. They would not equalize the pressure of the brake shoes on the wheels. This forced a change of the system to a form in which the brakes were supported from the axle box frame and equalizing levers incorporated in the brake rigging. With the advent of the independent car truck the lever system was built on it, and the connections with the hand staffs for the operating levers made through chains or a combination of chains and levers, thus providing a maximum of flexibility.

With the adoption of mechanical power, the hand brake had to be supplemented with a brake that did not depend on the brawn of the driver. Cable cars ordinarily employed track brakes, consisting of brake blocks pressed against the rails by a system of levers. These were also hand brakes, and required a heavy pull or an extremely long leverage. The air brake, which had been so successful in steam railroad service, was soon adapted to the needs of street cars. One of the earliest air brakes was installed by the Westinghouse Air Brake Company in Pittsburgh in 1890. It had an axle-driven compressor and a control not unlike that in use today for straight air. Other manufacturers entered the field, and many different types of air brake were brought out. Stationary air compressors with storage tanks on the cars have been tried. By 1895 motor-driven compressors had driven out the axle type. No essential change has been made in the straight air brake since that time. When rapid transit made it necessary to run cars in fairly long trains, the automatic air brake was adapted to the service. The use of automatic air has continued wherever trains of more than two cars are used to any extent. Electro-pneumatic control of the brakes in order to obtain simultaneous application on all cars of a train has been used in all recent rapid transit equipment.

From the earliest days of electric railways it was realized that the motors could be used for braking, either by short-circuiting them through a resistance or by using them as generators and feeding current back into the line. Many inventors have attacked the problem and working on these principles, have devised brakes which have been practical. Electric current, either generated by the car motors or taken from the line, also has been used for various solenoid brakes. The most effective of these have a shoe or shoes touching or approaching the rail head, the lever system being so arranged that the car is drawn against the rail with increased force, thus making the wheel brakes more effective and preventing skids. The best known of the early brakes of this type was the Newell brake, brought out by the Westinghouse Company in 1901.

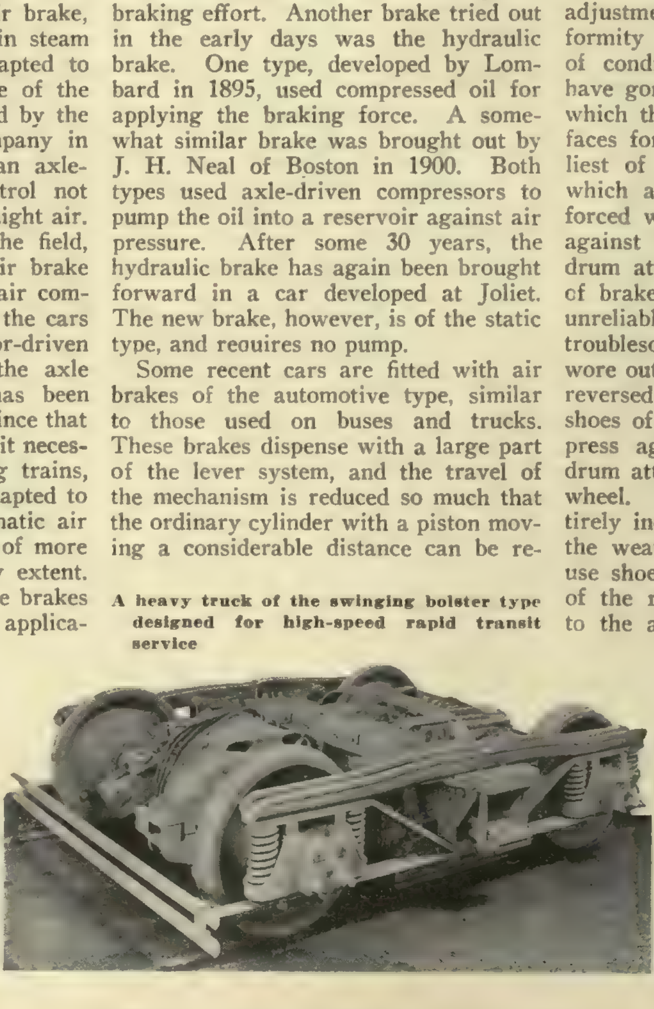
Numerous other types of brakes have been used. The friction brake of W. L. Abbott, developed on the North Chicago Street Railway in 1889, was one of the earliest of the so-called momentum brakes. By pulling on a lever a chain was drawn tightly around the axle, the movement of the axle itself tightening the chain further and increasing the braking effort. Another brake tried out in the early days was the hydraulic brake. One type, developed by Lombard in 1895, used compressed oil for applying the braking force. A somewhat similar brake was brought out by J. H. Neal of Boston in 1900. Both types used axle-driven compressors to pump the oil into a reservoir against air pressure. After some 30 years, the hydraulic brake has again been brought forward in a car developed at Joliet. The new brake, however, is of the static type, and requires no pump.

Some recent cars are fitted with air brakes of the automotive type, similar to those used on buses and trucks. These brakes dispense with a large part of the lever system, and the travel of the mechanism is reduced so much that the ordinary cylinder with a piston moving a considerable distance can be replaced by a diaphragm with relatively small movement. By this means the quantity of air needed is greatly reduced and the air compressor can be correspondingly much smaller.

From early days the actual friction producing the braking effect was developed by shoes pressing on the wheel treads and sometimes on the flanges. Wear of wheels and shoes makes frequent adjustment necessary. Furthermore, the shoes have a limited life. Cast iron, with or without inserts of various materials to increase the friction or reduce the wear, has been the accepted material for brakeshoes for years. Improvements in composition and methods of casting have resulted in a material increase in the life of brakeshoes, without a corresponding loss of service of the car wheels.

As a means of reducing the need for adjustment and in order to retain uniformity of braking over a wide range of conditions, a number of designers have gone to the adoption of brakes in which the wheels are not used as surfaces for producing friction. The earliest of these was the band brake in which a band of fabric, usually reinforced with a metal backing, is drawn against the outer surface of a metal drum attached to the axle. This type of brake gave fair service, but it was unreliable when wet and also was rather troublesome to maintain, since the bands wore out rapidly. Some designers have reversed the practice, a pair of brakeshoes of molded material being used to press against the inner surface of a drum attached to the axle or inside the wheel. This type of brake can be entirely inclosed, making it proof against the weather. Still another plan is to use shoes pressing against one or both of the radial faces of a disk attached to the axle or to the armature shaft. Each of these devices has merit and with all of them the travel of the parts is much less than with the ordinary type of wheel brake. Also the braking surfaces, not being used for other purposes, wear away less rapidly and fewer adjustments are needed. The parts are fewer in number and are lighter than those of the wheel brake.

A heavy truck of the swinging bolster type designed for high-speed rapid transit service



Victory Over Political *and* Engineering Obstacles *Is* Rapid Transit Achievement

By Ewing Galloway, N. Y.

Rapid transit trains on the Brooklyn Bridge have united the boroughs for many years

"PURSUIT of a suitable and adequate system of rapid transit has been constant. The sought-for ideal has been at times almost in sight; again it has disappeared, only to be revived as the struggle for it grew in strength. Romance and tragedy, few successes and many failures marked the quest. In its service men . . . have sunk their all in vain attempts to materialize their dreams only to retire bankrupt and see other men reap golden harvests from their crops. The history of rapid transit is replete with flashes of genius and the sordid spirit of greed. The struggle for public franchises alone . . . provides material for a thrilling drama." Thus James Blaine Walker, secretary of the New York Transit Commission, sums up the history of a service that has been vital in the upbuilding of great metropolitan cities.

NEW YORK

New York City, the largest metropolis on the continent ever since Colonial days, was easily the first to become seriously congested. Manhattan Island was settled at the southern extremity and, being long and narrow, grew toward the north. Three steam railroads entered the city and several others reached terminals in New Jersey and Long Island, connecting with Manhattan by ferries. Omnibuses were the principal local vehicles. By 1850 they made up nearly 40 per cent of all the traffic on Broadway. A count showed a thirteen-second headway. Street cars ran on some of the other thoroughfares, but the service was inadequate to meet the heavy demands.

It was to alleviate such conditions that in 1864 Hugh B. Willson, heading a number of prominent New Yorkers, incorporated the Metropolitan Railway Company, with a capital of $5,000,000, to construct an underground railroad. The plans called for an arch-roof tunnel lined with brick and carrying two tracks. Propulsion was to be with steam locomotives. The line was to run in Broadway from the Battery to 34th Street and then in Sixth Avenue to 59th Street. The London Underground had opened in 1863, and its success caused the project to be well received. In the Legislature, however, the opposition of the existing transportation lines blocked a franchise. A new bill passed by the Legislature in 1865 was vetoed by the Governor. Several bills were introduced by other persons, but nothing came of them.

However, in the confusion the railroad law of 1850 was amended in 1866 by authorizing the formation of a company to build a railroad with a cable driven by stationary power as a source of propelling force. Charles T. Harvey, in whose favor this amendment had been passed, planned to build an elevated railway with his patented cable drive. His main route was from the Battery up Greenwich Street and Ninth Avenue and finally to Kingsbridge. He also proposed lines up Broadway to Yonkers and up Third Avenue to Harlem. Harvey organized the New York Elevated Railroad Company, and in 1867 constructed an experimental single-track section of his railway ½ mile long in Greenwich Street northward from Battery Place. This was placed in trial operation in June, 1868. The plan was adjudged practical by the commissioners provided in the act. So well were the directors pleased that they authorized the inventor to extend the line to Cortlandt Street.

Financing proved difficult, and in 1869 the bankers forced a receivership. After a reorganization the single track was extended in 1870 as far as 30th Street. The cable method of propulsion proving a failure, the bondholders obtained permission to substitute steam locomotives, and on April 20, 1871, operation began again with a train of three cars hauled by a dummy engine. The road has been in service ever since.

Pursuant to a law passed by the Legislature of 1868, construction of a "pneumatic dispatch" tunnel was permitted under Broadway for mail and packages. The promoters built a section of passenger tunnel instead. It was a 9-ft. circular bore 312 ft. long between Warren and Murray Streets. Alfred E. Beach, the inventor and builder, used the shield method of tunneling for the first time in America. A circular car fitting closely inside the tunnel was propelled by air pressure obtained from a large blower at the end of the tube. A trial trip was made in February, 1870. The Beach company failed to raise capital and the atmospheric system did not prove a success.

The same session of the Legislature, 1868, authorized a subway up Pearl and Mulberry Streets, Fourth and Madison Avenues to the Harlem River. Some work was actually begun to hold the franchise, but the line never was built. Several other subway companies were organized in succeeding years, but none of them managed to do any construction.

Meanwhile considerable activity was manifest in elevated railroads. Dr. Rufus H. Gilbert and his associates obtained a charter in 1872 for a "patent" railroad of his invention. Tubular iron roadways were to be suspended above the street from Gothic arches and cars propelled through them by atmospheric or other power. The route was that of the Sixth Avenue line. The panic of 1873 prevented the company from getting capital and application for relief was made to the Legislature. As a result the act of 1875 was passed creating the first Rapid Transit Commission. The act confirmed the routes of Gilbert's company and also laid down many "connecting" lines for the New York Elevated Railroad. The commissioners authorized the latter company to build a connection with its Ninth Avenue line to reach the Grand Central station by an "extension" from South Ferry. This was the Third Avenue elevated.

Testing New York's first elevated in Greenwich Street—1867

By the Rapid Transit Act the commissioners were authorized to organize a company to build a road if none of the existing companies carried out the plans approved. Under this clause the Manhattan Railway Company was organized ready to step in if either the New York Elevated or the Gilbert Elevated failed to complete its contract. The former company completed the Ninth Avenue line as far as 59th Street and began operating it in 1876, and to South Ferry in 1877. The Third Avenue line from South Ferry to 42nd Street was opened in August, 1878, and extended to 125th Street in December of the same year. In 1880 the Second Avenue line was built to 67th Street and the Ninth Avenue line extended to Harlem.

Gilbert's lines were held up by legal proceedings, but the Sixth Avenue line to 59th Street finally was opened in 1878. Financial difficulties ensued, and the Manhattan Railway came into the picture in 1879, leased both systems, and completed construction. With the extensions to the Harlem River in operation traffic grew by leaps and bounds and the enterprise became profitable. More than 60,000,000 passengers were carried in 1880. Fares of 10 cents were established, but the Rapid Transit Commission specified a 5-cent fare during hours when workers were going to or from business.

Following the success of the first elevated railroads in Manhattan the demand was made for similar facilities in Brooklyn. The Brooklyn Steam Transit Company was chartered in 1870 to build an elevated road from Fulton Ferry to Flatbush, but capital could not be raised. However, the Brooklyn Elevated Railroad was chartered in 1874 to build a road from the end of the new Brooklyn Bridge to Woodhaven through Fulton Avenue and East New York. After numerous vicissitudes ground was broken in 1876, but it was not until 1885 that the first section was put in service. Meanwhile the Kings County Elevated Railroad was organized in 1878. It also had difficulties, but finally built the Nostrand Avenue line, which was placed in operation in 1888. The Union Elevated Railroad, organized in 1886, built several lines which were leased to the Brooklyn Elevated Railroad. Within a few years all the properties in the city were acquired by the Brooklyn Rapid Transit Company.

All of these lines, both in Manhattan and in Brooklyn, were operated for years with steam locomotives. Success of electric service in Chicago and elsewhere caused agitation in favor of electrification in New York. Finally arrangements were made to equip the Brooklyn lines, which began service with multiple-unit electric trains in 1898. Electrification of the New York elevated lines was then a foregone conclusion, and they were all converted with the multiple-unit system by 1902.

Agitation in favor of city-owned lines in New York began as early as 1873, when the plan was suggested by Abram S. Hewitt, later Mayor. For many years public opposition was apparent, but in 1891 an amendment to the Rapid Transit Law authorized the Mayor to appoint a Rapid Transit Commission with power to lay out routes for construction with either public or private capital. Such a board was appointed, but failed to accomplish anything, and the Legislature of 1894 created a new commission. Alexander E. Orr was chairman and William Barclay Parsons chief engineer. This was the board that built the first New York subway. One of the early decisions of this new board was that underground railways were necessary. Difference of opinion developed as to route, a board of experts recommending a line on the East Side through Fourth Avenue, while the commission itself favored Broadway. Finally, after a great deal of argument, including an appeal to the Supreme Court, a compromise route was selected in 1897 going from City Hall via Elm Street and Fourth Avenue, across 42nd Street and up Broadway to Kingsbridge. Extensions under Lenox Avenue and to Bronx Park also were included. Four tracks were specified from a loop at City Hall to 103rd Street, all on one level. This zigzag route proved costly years later when extensions were made. A modification of the original plan extended a two-track line from City Hall to a loop at the Battery.

Formation of Greater New York in 1899 by inclusion of Brooklyn, Queens, Richmond and the Bronx caused more or less embarrassment, for the proposed line was entirely in New York County. The Manhattan Railway about the same time caused trouble when it arranged to apply for extensions to its system. The large bond required of the contractor, $15,000,000, also made it difficult to get anyone to undertake the construction. The new city administration, too, seemed ready to block the project. About this same time the Metropolitan Street Railway, controlling all the surface cars in Manhattan, came forward with a proposition to build the subway in return for a perpetual franchise. But finally, by the end of 1899, the legal difficulties had been smoothed out. John B. McDonald, who was backed by August Belmont, was the successful bidder for Contract No. 1, which provided for construction and operation of the line for 50 years. The city furnished such land as necessary and the contractor supplied the equipment for operation. In 1901 it was decided to extend the subway to Brooklyn, and Contract No. 2 was executed to cover that portion of the line. Operation of the first portion of the subway began Oct. 27, 1904, with multiple-unit electric trains. The extension to Atlantic Avenue, Brooklyn, was opened in 1908.

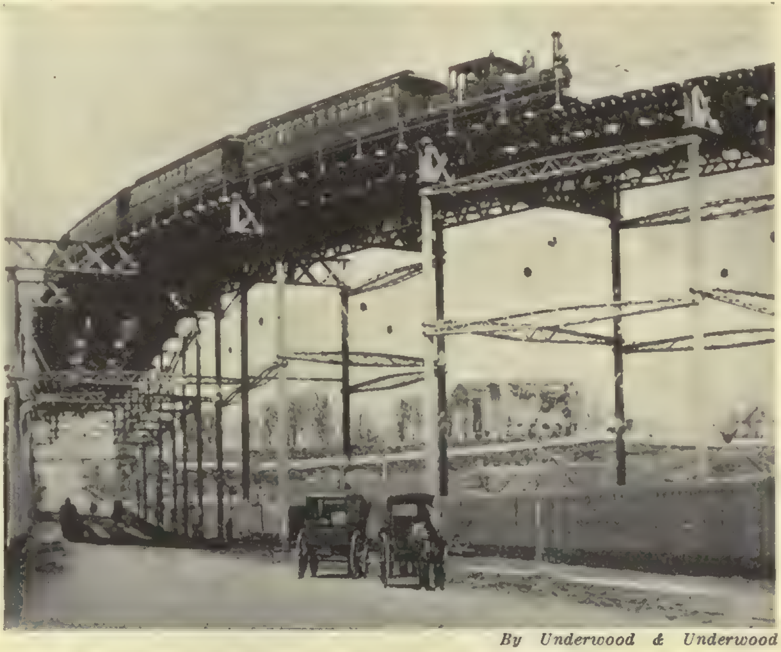
During the progress of the work the Interborough Rapid Transit Company was formed to operate the subway on its completion. In 1903 the new company leased the Manhattan Elevated Railway for 999 years, placing the Interborough in control of all rapid transit lines in Manhattan and the Bronx. Before the completion of the subway the Metropolitan Street Railway formulated plans for a competing subway which were given great attention. Finally the Interborough was forced to purchase the Metropolitan company in 1906.

Meanwhile new routes were being laid out by the Rapid Transit Commission. Before the first subway had been in service a year it began to be inadequate. Criticism of the commission, despite its success, became so insistent that in 1907 a law was passed abolishing it and creating two State Public Service Commissions, the first district comprising New York City and the second district the remainder of New York State. One of the first acts of the new commission was investigation of the acquisition of all the Manhattan surface car lines by the Interborough. In the progress of the investigation the creditors of the surface car company forced a receivership. As a result of this receivership the surface lines in Manhattan were split into two new companies, the New York Railways and the Third Avenue Railroad, the latter entirely independent of Interborough influence.

Rapid transit projects were pushed as fast as possible. The mistake of the zigzag subway was rectified by making two routes, east side and west side. The lines were continued through to Brooklyn. Station platforms in the old subway were lengthened and third tracks were added to the Second, Third and Ninth Avenue elevated roads. New routes were laid out in the Bronx and in Queens. After considerable difficulty it finally was decided in 1911 to award the subway contracts jointly to the Interborough and the Brooklyn Rapid Transit Company. Construction work was begun the same summer.

The changes made by the dual system contracts were far-reaching. The Interborough previously had 191 miles of subway and elevated track. This was increased to 360 miles. The Brooklyn system, formerly all elevated, went from 105 miles up to 260. In other words, the single-track mileage of rapid transit lines in the city was more than doubled. Minor additions have been made since that time.

Even with this great expansion the needs of the city have not been met. Politics crept in and prevented a continuous program of expansion to meet the growth of population. After several changes in legislation the present Board of Transportation was organized in 1924 and empowered to build new subways. Following many delays construction was started in earnest in 1928, and it is hoped to have the first of the new lines, the Eighth Avenue subway, in service before the end of this year.



By Underwood & Underwood

The famous 110th Street curve on the Manhattan Elevated when rapid transit in New York was young

HUDSON TUBES

From early days ferries plied across the Hudson River between New York and New Jersey. The irregularities of the service prompted various schemes for tunnels under the river, dating from the middle of the nineteenth century. However, the first to be incorporated was the Hudson River Tunnel Company, formed in 1873 to construct an underground line connecting New York with the railroad terminals in New Jersey. Work was begun late in 1874 by sinking a shaft in Jersey City at Fifteenth Street. Litigation held up the work until 1879, when the shaft was sunk deeper and a heading started for the tunnel 60 ft. below the surface. The plans adopted called for two elliptical tunnels, each holding one track. The north tunnel was driven 280 ft. when a blowout of air occurred in 1880, drowning the workmen and flooding the tunnel. In 1881 work was resumed, but it was stopped for lack of funds the next year after the north tunnel had been driven 1,542 ft. from New Jersey and 74 ft. from New York, and the south tunnel 570 ft. from New Jersey. Work was resumed at various times and a small amount of progress made. In 1889 S. Pearson & Sons of London took over the work with English capital and by 1891 carried the north tunnel to a point 3,900 ft. from New Jersey by the use of the shield tunneling method. Again funds gave out. It was not until 1902 that the scheme became active again when William G. McAdoo organized the New York & New Jersey Railroad. This company resumed the work, and the same interests formed the Hudson & Manhattan Railroad to build two similar tunnels to lower New York. The north one of the old tubes was carried through in 1904 and its mate in 1905. A franchise was obtained to continue the line in New York under Sixth Avenue as far as 33rd Street. Meanwhile work was started on the lower pair of tubes, and twin 22-story office buildings were erected over the terminal at the New York end. These lines began operating in 1908. In 1912 a connection was made with the Pennsylvania Railroad and through service established to Newark. From the beginning the system was operated with all-steel multiple-unit trains.

CHICAGO

Observing the success of the elevated railroads in New York, it was not long until demands were made for similar facilities in Chicago. There was some talk of building a line like Harvey's elevated in New York. Again, as early as 1886 Chicago was planning subways. In 1888 a proposal was made for an underground transit system to have a main line under Monroe Street, with a loop about the business district. This plan never progressed much farther than the ordinance stage.

Following this project a real step was made in 1888 when a company was formed to build an elevated railroad to the South Side. Consent was soon obtained and construction was begun. In anticipation of the World's Fair of 1893 work was pushed and the road was opened on June 6, 1892, as far as 39th Street. It was extended to the fair grounds in Jackson Park in time for the exposition. Steam locomotives were used to haul trains of trail cars. Unlike the elevated railroads in New York, which were erected over city streets, this and other Chicago lines built later were constructed on private right-of-way through the middle of the blocks. Thus the South Side line became known as the "Alley L."

Chicago Aerial Survey Co.

Chicago's famous Loop District—made possible by rapid transit

One of the great attractions at the World's Fair was the Intramural Railway. It was an elevated loop line, with its several stations near the principal exhibit centers. The road, opened for traffic on April 20, 1893, was the first demonstration of heavy electric train service. Passenger cars equipped with motors hauled one or two trailers. On the occasion of "Railroad Day" a demonstration was given of a train of seven trailers hauled by a single motor car. The road was in service the entire time of the exposition. It carried thousands of passengers and gave a great impetus to heavy electric traction.

In 1892 A. F. Walcot of New York formed the Metropolitan West Side Elevated Railway to be run with 40-ton steam locomotives. Success of the Intramural Railway made the builders change their plans and adopt electricity. When the line was opened on May 17, 1895, from Franklin Street for a distance of 5 miles westward it was the first permanent all-electric elevated railroad in the United States. Like the South Side Elevated it was built on private right-of-way for the greater portion of the distance.

Meanwhile the Lake Street Elevated Railway had been built parallel to the Metropolitan for a distance of 6½ miles from the center of the city. So successful was the latter that the Lake Street line was changed over to electric operation during June, 1896.

Last of the rapid transit systems to be built in Chicago was the Northwestern Elevated. The first contract was let in February, 1895, but it was not opened until 1900. It was the first one of the elevated lines for which electric service was planned from the inception of the road.

As originally built the Chicago elevated railways were operated independently. Each of the four systems had its own terminal at the outskirts of the central business district, which at that time was about ½ mile square. In 1894 a loop delivery line was proposed, and after somewhat extended negotiations it was constructed by a new company, financed largely by the four elevated railways. The new line made a double-track loop on Wabash Avenue, Fifth Avenue, Lake Street and Van Buren Street, with connections to the four systems.

Contracts for the electrification of the South Side Elevated, the last of the Chicago systems to be converted, were let in 1897. Unlike the older electrifications, in which one motor car hauled several trailers, this one called for the use of several motor cars, controlled jointly by one motorman through the use of the multiple-unit control system devised by Frank J. Sprague. This installation, put in service in May, 1898, proved epochal in rapid transit. All the other elevated railroads soon were equipped with multiple-unit control, either the Sprague system or the electro-pneumatic type.

Certain tunnels had been built toward the end of the last century to carry the street car lines under the rivers to prevent drawbridge delays. In 1900 John M. Roach, then president of the Union Traction Company, proposed a system of subways under the principal downtown streets connected with the under-river tunnels to provide a terminus for the principal street car lines. Nothing came of the project, nor of others which were brought forward at various times.

When the consolidation ordinances of 1907 were drawn up subways were incorporated as an element in the plan. Annual payments of the surface lines to the city were impounded to form the nucleus of a fund for construction of rapid transit lines. From time to time plans have been made to begin such a system, but up to the present no definite action has been taken. Legislation adopted last year for the consolidation of all local transportation lines in the city, however, paves the way for the construction of rapid transit subways in Chicago's business district, with subsequent extensions of subway and elevated lines to cover the entire city.

BOSTON

Rapid transit in Boston dates from 1891. During that year Henry M. Whitney discussed the possibilities of an underground passenger railway as a means of reducing street congestion in the business district, principally on Tremont Street. Early in 1892 the Rapid Transit Commission, formed the year previous to investigate the matter, agreed on a provisional loop route, partly elevated and partly underground. The plan was not approved and in 1894 the Legislature appointed a new board. The arrangement adopted called for a double-track subway from an entrance at Park Square via Boylston and Tremont Streets to an underground loop at Park Street. Surface cars were diverted into it from the Back Bay and Roxbury districts. This section, opened in September, 1897, was the first subway in America. Another pair of tracks enter the subway at Pleasant Street, paralleling the first pair of tracks from Boylston Street to Park Street, with a second loop at that point. A similar subway with four tracks went from the vicinity of North Station via Haymarket Square to Adams Square and Scollay Square, where loops were constructed. A connection under Tremont Street between Park Street and Scollay Square gave a through route under the city. As a result all street car tracks were removed from Tremont Street.

Subway construction in Boston was undertaken by the city and the structure leased to the operating company. This was an innovation in the history of city railways in America. Need for real rapid transit service becoming more and

Entrance to the Boylston Street Subway at Park Square—the first subway in America

more apparent, in 1897 a bill was passed in the Massachusetts Legislature for the charter of a comprehensive elevated railway system. The main route was to be from Sullivan Square in Charlestown to Dudley Street in Roxbury, via Atlantic Avenue, a distance of 5 miles. It also was proposed to construct an alternate route under Tremont Street, utilizing the street car subway between North Station and Pleasant Street, joining the elevated track as near those points as possible. This plan was adopted with minor modifications and the line was placed in service in 1899 with multiple-unit trains. Thus Boston not only has the first subway, but also the first underground rapid transit system in America. The Atlantic Avenue elevated was not opened until August, 1901.

Inauguration of rapid transit service deprived the surface lines of one pair of tracks under Tremont Street, but it made possible a new type of transportation. The rapid transit trains in Boston are run by the same company as the surface cars, and at prepayment stations in the subway it became possible to change cars without the use of paper transfers. This system was later extended by the establishment of prepayment areas for surface cars under elevated stations and at a few subway stations.

Soon it was realized that Boston's rapid transit system was inadequate. Construction of a new tunnel beneath Washington Street, opened in 1908, gave a more direct route for the trains, and the Tremont Street subway was restored to its original purpose of carrying surface cars.

East Boston was connected with the center of the city by a tunnel under the harbor between Maverick Square and Scollay Square, begun in 1900 and opened at the end of 1904. Later it was extended to Bowdoin Square to provide a direct route to East Cambridge and Somerville. The Washington Street elevated was extended from the terminal at Dudley Street to Forest Hills in 1909, and from Sullivan Square to Everett in 1919.

The most important of the later developments in Boston's rapid transit program was the inception of the Cambridge-Dorchester subway. The original portion of the system was built by the company but later was purchased by the State of Massachusetts and leased to the railway. The first section, opened in 1912, connected Harvard Square, Cambridge, with Park Street, the Charles River being spanned by a bridge. Subsequent extensions carried the line to South Station, Andrew Square and Ashmont. The latest extension has been made through the electrification in 1929 of a branch line leased from the New Haven Railroad. This line, between Ashmont and Mattapan, is being operated with high-speed surface cars, but has stations of the rapid-transit type.

Market Street—under this is Philadelphia's first subway

PHILADELPHIA

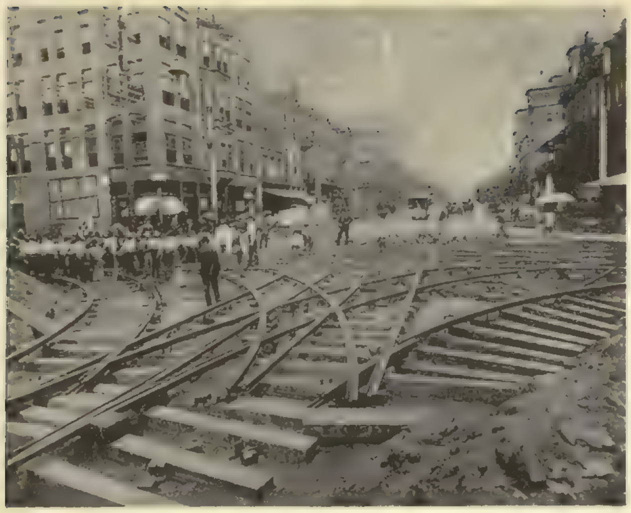
In 1901 the Pennsylvania State Legislature passed an act sanctioning the incorporation of elevated and subway companies, and the Philadelphia Council granted franchises for several projects, including numerous elevated lines as well as a subway under Broad Street. In 1902 the Council authorized the building of a subway under Market Street east of the Schuylkill River to take the place of the elevated road contemplated in the original franchises. Several other franchises were passed. All of them subsequently were acquired by the Philadelphia Rapid Transit Company, and a broad plan for giving genuine rapid transit facilities in conjunction with the existing surface lines was formulated. As in Boston, all lines are run by one company and transfers are given between rapid transit and surface cars.

First of the routes to be constructed was that portion of the Market Street subway between the west side of City Hall and the Schuylkill River, where it crossed on a bridge and continued on an elevated structure to a terminal at 63rd Street. Soon the line was extended to 69th Street and a joint terminal established with several interurban railroads. This first section of the subway, begun in 1903 and completed in 1905, contained four tracks, the two inner ones being for rapid transit trains and the two outer ones for the diversion of surface cars from Market Street. The latter tracks were later extended in a loop around City Hall, and the rapid transit subway continued east to the Delaware River. In 1920 the Frankford line was placed in service.

Construction of the Market Street elevated differs from that in New York, Chicago and Boston in that the structure has a closed concreted floor system, preventing drippings to the street and reducing noise materially. The track is laid with wood ties on 5 in. or more of broken stone ballast.

Plans for a subway under Broad Street were made many years ago. They were modified several times, and it was only in 1928 that the first section, from City Hall to Erie Avenue, was opened. Extensions underway and contemplated will, in conjunction with the surface cars and buses, give Philadelphia a modern co-ordinated transportation system.

Improvements in Track



Typical track construction of the early '90's. "Bolted Up" special trackwork on chairs laid in Atlanta, Georgia, 1891

FIFTY years ago is far enough back so that only an occasional track man has any personal recollection of the track construction of that time other than as a passenger on some horse car line, or perhaps in riding a high bicycle across a cobble-paved track at imminent risk of disaster. One of the best-known members in the industry admits that his ambition was to drive the extra horse pulling the car up the hill for the sake of riding down on the horse's back. In several very hilly cities the "hay-motor" himself rode down the hill on the back platform.

The same ambitious youth referred to above says:

> One of the reasons why I left the street railway business in 1891 was the result of an engineering report to the effect that their present construction of 6-in., 70-lb. rail on a 4-in. stringer on cross ties would last indefinitely, if not forever. This followed a survey in which no measurable wear was found on the rails after a year's use. My reaction at the time was that maintenance of such a proposition was not likely to call for much engineering service.

In 1881 there were about 6,000 miles of street railway track in the United States, but these were horse car tracks, for at that time it was only the dreamer who thought of electrically driven cars. Then the cable car was considered the coming means of city transportation. Even the flat rail had a predecessor in the bar or flat strip of wrought iron, which, nailed to a wooden stringer, formed the support and guide for the car wheels. An interesting intermediate type was that of a bent plate laid in St. Paul and Minneapolis in the early '70s. This track consisted of wooden stringers, 5 in. square and 16 ft. long, laid on wooden ties. The stringers were drift bolted or spiked to the cross ties. On top of the longitudinal stringers, bent iron plates, weighing 23 lb. per yard, were laid to act as rails. The track was narrow gage, 3 ft. 6 in. wide. The cost of such construction was $6,000 per mile.

This type was succeeded by the "side-bearing" flat rail, and that, in turn, by an early form of girder rail. Paving in those days, if any, was usually of cobble stone. In the Twin Cities, 50 years ago, they tried for a few years a type of round cedar block, only to learn, as we well know now, that perfection in a pavement has not yet been attained.

The cars that rolled over these old rails were 10 ft. long, mounted on four light wheels, and weighed about 1,000 lb. Each car was drawn by one horse or one mule. The fare box was placed in the front of the car, and the passengers were expected to deposit their fare on entering the car. If the passenger was forgetful, the driver rang a bell until he paid his fare.

The cars on each line were painted a different color to distinguish the line. In winter, the cars were heated by a small sheet-iron stove on one side in the middle of the car. The driver stood on the front platform protected by a sheet-iron dash extending a little above his knees. The driver attended to the horse, kept a lookout for passengers, saw that all passengers paid their fare, and was on the car sixteen hours per day with twenty minutes off for lunch. The wages were $35 per month.

Just as the horned toad and certain shellback types of animals have, we are told, survived their contemporaries by millions of years, so the flat rail and the horse car persisted for many years, side by side with the improved track and electric operation. Probably the most notable instance was in New York City. Horse cars were operated there until 1917, and horse car tracks have persisted unused to the present time, being gradually removed as streets are repaved. Most of the tracks, it is true, were changed to girder rail construction, but it was of a very simple type.

An intermediate step was the use of storage battery cars on the old horse car lines, which necessitated some track reconstruction and the installation of improved special work, giving a construction similar to standard trolley track, except that it was somewhat lighter. Some of these storage battery lines are still in operation in New York City.

It is perhaps not generally understood in other parts of the country why this curious condition existed, but there was a good reason for it. In the first place, overhead trolley construction has never been permitted on Manhattan Island except for very short distances over some of the bridges from the Borough of the Bronx. The underground conduit or slot type of track construction required in Manhattan is extremely expensive, costing from five to ten times as much as ordinary surface track, depending on the amount of underground obstructions to be moved and the extent of complicated special trackwork required. In the second place, the building of rapid transit lines in New York, beginning about 30 years ago, has completely altered not only the lines of traffic but the distribution of residence, business and industrial districts. The ferries, which formerly carried an enormous amount of traffic, have virtually disappeared, except those to Staten Island supported by the Municipality and those to New Jersey supported by steam railroads. Entire street railway systems that once served these ferries and were profitable have ceased to exist or are no longer able to pay dividends, so that the failure to change horse car lines to electric lines was not due to lack of foresight or initiative but rather to the use of good judgment and to hard facts.

By the end of the first decade of the past 50-year period the design of rails had passed through the experimental stage and reached the types with which we are still familiar. Among the outmoded rails were the side and center bearing flat rails, the Wharton "Butterfly," the Louis & Fowler box girder rails, the Gibbon Duplex, and the Gribble box girder rails. The first girder rail actually rolled was the Section 72 of the Cambria Iron Company, Johnstown, Pa., in 1877 for the Clay Street Line in San Francisco.

The track in horse car days is best described by a track man, now retired, whose delightful personality and entertaining reminiscences are known to all

Have Kept Pace with the Industry's Needs

By

E. M. T. RYDER

Way Engineer
Third Avenue Railway
New York, N. Y.

track engineers in this country and Canada.

The rail was 1½ in. thick in the head and was laid on a wooden stringer the width of the rail and 6 in. deep, resting on similar sized crossbeams set about 10 ft. apart. The rail was spiked through the tram portion of the stringer. If insufficient space was allowed at the joints, in very warm weather the middle portion of a 30-ft. rail would rise from the stringer several inches and remain until it could be cooled with water. If it turned over sidewise onto the pavement, the services of the track gang were required to restore it to place. In the meantime, the cars would roll along on the wooden stringer. This was not an unusual event, for many old timers had seen cars in New York City pulled entirely from the track to clear an unloading truck which temporarily blocked the way.

In New Orleans where suburban track was laid without paving, and cars were drawn by one mule, a plank about 1 ft. wide was laid in the middle of the track, and the mule, generally wise to conditions, kept religiously on the plank lest, in wet seasons especially, he become mired in the soft ground.

A search of the old volumes of Electric Railway Journal brought to light so many instructive and amusing facts that a few of them are given below. In the 1880's we have this description of the different track gages for horse car lines that were used in England and France.

The gage adopted in England is the same as that in this country—namely, 4 ft. 8½ in. In France the gage is 1.54 meters, or very nearly 5 ft. The gage is so wide that when two horses are pulling the car, they can trot with ease without stepping on the rail. In this country the horses are continually stepping on the rails because the gage is narrow. The French say that when the rails are placed nearer together than their standard it is necessary to harness the horses in tandem. Although tandem driving is perhaps best for freight hauling, it is not desirable for the transportation of passengers.

In the same period, the West End Company, in Brookline, Mass., is reported as laying track with English grooved rail known as the "Liverpool Rail." In section it was of the I-girder form, similar to that in use on steam roads, but was 7 in. high with a ½-in. web with a 6-in. flange and face.

A description of the foundation will make some track engineers decide that they were born too late.

The bed for the rail consists of concrete filled trenches, 8 in. wide by 8 in. deep, made of the best Portland cement, one barrel of cement to two barrels of sand, mixed with small, hard broken stones, and well rammed. The base of the rail has a continuous bearing on the surface of the concrete.

Before the day of mass transportation
"Five Points," Atlanta, Ga., 1892

Not to neglect the pavement, a description is given that will be vivid to the older men in the industry.

While for many reasons the cobblestone is an excellent pavement for the space between the rails, yet, as ordinarily laid, the cobble footway soon looks like a relief map of the moon. The stones being of unequal size, the small ones sink deeper into the bed than the larger ones. Hence, those which offer most resistance to foothold and traction give the roughest riding to ordinary vehicles. It is necessary to bed the larger stones next to the stringers to give the stringer and rail lateral stiffness. The rest of the cobbles are generally put into the ground without reference to their size and shape.

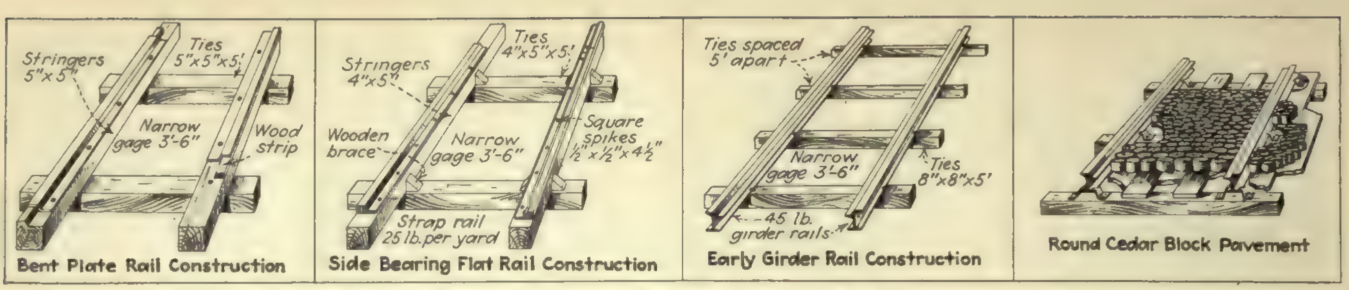
There are some who may imagine that the steel tie is a recent invention, but several early attempts were made to construct a metallic roadbed. In this construction no wood was used. The rail was of a peculiar shape with a 2-in. web on the underside, and was keyed to hollow cast-iron stringers connected at intervals with flat iron tie rods. The stringers were cast in sections of 4 ft., and weighed 82 lb. The system cost $1,000 per mile more than wood construction, but "once built there is no cost for repairing the substructure, and when a rail wears out it can be replaced without disturbance of stringers."

The word "girder" appears first during the '80s.

One would naturally think that the first cost of laying track by the girder system would be larger than by the old, but the manufacturer is prepared to prove that it is much less, and that they will last five times as long.

It is interesting to note that many of the earliest rails were built without any bottom flange. The rails were then placed on chairs, and many efforts were made to find a design in which the head would be renewable without taking up

The same location as it appears today



Bent Plate Rail Construction — **Side Bearing Flat Rail Construction** — **Early Girder Rail Construction** — **Round Cedar Block Pavement**

Some interesting types of early track construction in Minneapolis

the support. A common method for obtaining height without paying for all the steel required by the solid 9-in. rail was to support a shallow rail on chairs. Such an installation was made in Atlanta in 1891.

The rail joint problem may or may not be solved at the present time. In the '80's they were still able to write:

> This rail joint is designed to furnish a joint for rails that will prevent the lamination of the rails at either end, and also the jarring and noise created by the passage of the car wheels over the joints.

Now we go to the '90s, but find there are still problems unsolved and noises that force the building of new tracks. On the Fourth Avenue Railway, owing to the rigid construction of the roadbed, cars made a great deal of noise which could be heard two or three blocks from the Bowery. This construction soon proved unsuitable owing to its rigidity. The blocks were taken up and stringers of Georgia pine substituted, the granite stringers being sold to the city for gutter stone.

GIRDER RAIL AROUSED EARLY DISCUSSION

Fast and furious raged the battle over track design during the '90's. A proponent of the Gibbon duplex lap-joint rail, which was laid in New York City, took this crack at the coming girder rail:

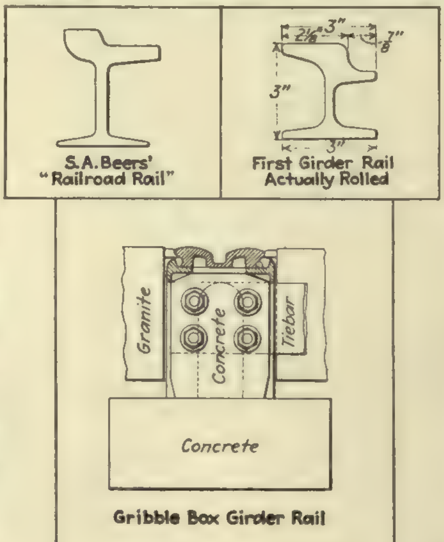
> An English fad, fortunately as difficult to introduce in America as the single eyeglass, is a street rail weighing 100 lb. per yard, of which 7 per cent represents its head-wearing capacity and 93 per cent its scrap residue. But apart from the discomfort of riding on so inelastic a track, the short service rendered by the rail for so great an expenditure of material, and the serious annoyance of a complete interruption of travel at its frequent renewals, the track lacks homogeneity, and at every 30 ft. of its length, vibratory waves, set in motion by travel, break with a shock that speedily renders abortive this effort to perpetuate the device of hitching together rails to form street railway track.

Some one is sure to ask about the special track work of the last century. Below is a vivid description by an old-timer of how it was manufactured in horse car days:

> Less than twenty years ago, when a turnout was to be built, a pattern maker from an iron foundry would visit the ground with a load of wooden strips, which he would proceed to lay out on the ground, bending them to form the necessary curves. Having secured the model together, he would cut it into pieces so that he could load it onto a wagon and return to his shop. Patterns for cast-iron switches, mates, frogs and crossings would then be made and the rails bent to conform with the model. That work built this way would not always fit is not strange, for the wooden strips would often insist on warping out of shape before they were used. A piece of work was built after this manner as late as 1895.

Although the problem of rail expansion has been subjected to constant study it seemed to have been solved long before the middle of the 50-year period.

The modern girder rail is not so much a radical improvement over its predecessors as it is a refinement of basic principles



S.A. Beers' "Railroad Rail" — **First Girder Rail Actually Rolled** — **Gribble Box Girder Rail**

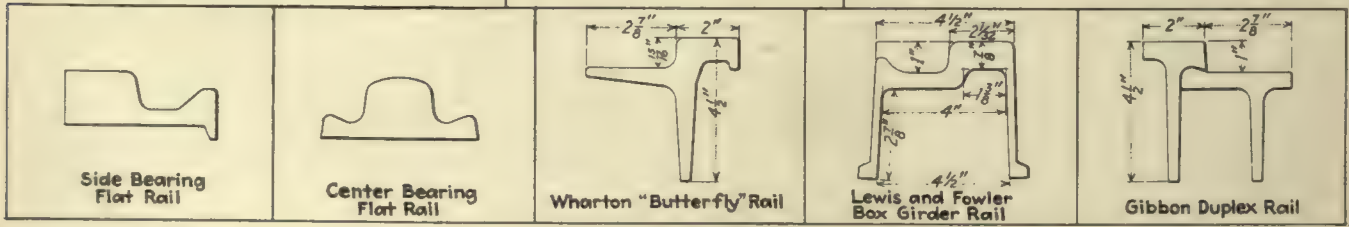
Here is a description of the vagaries of the old flat rail in hot weather:

> Following steam railroad usage, rails were kept open at the joints ⅛ in. or more to allow for expansion. To test the correctness of this practice for girder rails laid in paved streets, Mr. Moxham began a series of experiments on a 1,500-ft. stretch of track of 6-in. rail spiked to wooden ties and covered none too well with macadam. For nine months, hourly records of the air temperatures, and daily trials of the movements of the rail, if any, were made. To insure no expansion or contraction would take place at the joints, it being old track, all splice bars were removed, shims inserted wherever practical, and new special joint bars with sixteen turned and driven bolts inserted. As no expansion or contraction could be measured, this fact was published and the art of track laying from that date on has been for tight joints.

To A. J. Moxham and Tom L. Johnson is due the credit for the development of the girder rail and the rolling of many different sections. They organized in 1883 the Johnson Steel Street Rail Company, with the financial assistance of A. V. Du Pont, and the manufacture of the girder rail was begun in Johnstown, Pa. The Johnson Company then built their own rolling mill in Lorain, Ohio, where they rolled their first section in 1889. At this mill was produced the first 9-in. girder rail, weighing 90 lb. per yard. In the course of time the number of girder rail sections increased to over 300, varying in weight from 30 lb. to 174 lb. per yard. The name, The Lorain Steel Company, was adopted in 1898.

TRACK CONSTRUCTION SERVED AS MODEL FOR HIGHWAYS

The second decade of our 50-year period was one of enormous expansion, with electric lines reaching out from the cities into interurban territory, and with tracks varying from those on lines with poor alignment, grades and construction to those on lines approaching the best practice. The writer vividly recollects



Side Bearing Flat Rail — **Center Bearing Flat Rail** — **Wharton "Butterfly" Rail** — **Lewis and Fowler Box Girder Rail** — **Gibbon Duplex Rail**

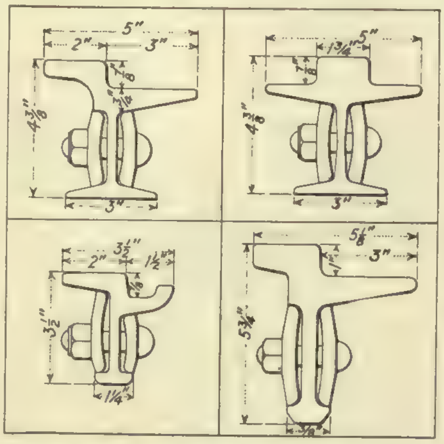
acting as assistant engineer in the construction of interurban lines in Connecticut where the improvement in alignment put to shame the highways alongside which the electric lines were built. Since that time, of course, the highways have taken on the engineering characteristics of railroads, and are being built with great attention to alignment, grades, super-elevation, drainage, and similar features.

During the development period of street railways there was but little attention paid to maintenance. Later, when the extension of electric lines decreased and stiffer competition was encountered as a result of the advent of the automobile, increasing attention was paid to track maintenance. One of the results was the attempt to establish standards in the industry. The way engineers' first efforts were directed toward standardizing the manufacture and design of rails. A.E.R.E.A. specifications for the manufacture of open-hearth steel girder rail were approved as recommended specifications in 1911. The present designs for 7-in. and 9-in. girder rails were adopted in 1910, and, after various revisions, became American standards in 1923. Efforts to agree on complete designs for track construction failed, due to the old bogey of local conditions, which frequently meant local prejudices. In 1915 a recommended design was approved for tee-rail construction on wooden ties and ballast, but nothing more definite has yet been accepted. One reason for this has been the fear that however satisfactory definite designs might be for the majority, they might prove embarrassing to some companies because of local problems of finance and control.

The present manual shows upward of 50 standards in the way division, covering both specifications and designs. In the development of these standards the helpful co-operation of the manufacturers was enjoyed. Much of the work, especially in the study of track layouts, would have been practically impossible without this aid. Standards have been adopted for track spirals, car clearance easements, and branch-off frogs. A factor which has also helped to simplify special trackwork has been the adoption of standard wheel flanges.

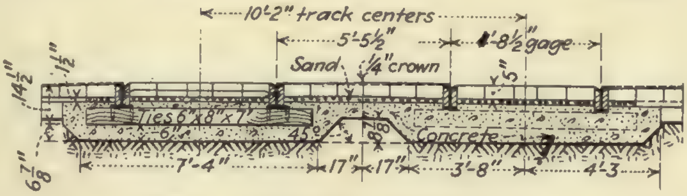
During the past few years designs have been worked out for manganese-steel track switches of all standard radii. All tongues are of similar design and are manufactured to definite limits so as to be interchangeable for each radius. Records of trial switches installed in the last two or three years are now being studied. It seems likely that the use of standard switches will increase. However, we have far to go to reach the position already attained by Canadian operators, who use standard switches in perhaps 90 per cent of their track layouts.

As the electric railways grew older it was found that 25-year franchises had a way of expiring sooner than was expected. Added to the fiercer competition, this resulted in financial turmoil for the systems in many cities. Reorganizations became prevalent, and were sometimes followed by rehabilitation on a large scale which gave engineers the opportunity to use carefully timed reconstruction methods involving track standards, on a hitherto unprecedented scale. In Chicago, during the five years from 1907 to 1911, inclusive, more than 500 miles of track were rebuilt. Standards were adopted for track alignment and for individual special work pieces. All switches were of either 80-ft. or 160-ft. radius, and all manufacturers furnished switches of the same design. Unfortunately, the Chicago alignment differed from that in use anywhere else. The present A.E.R.E.A. standards conform to the general practice throughout the country, and are not interchangeable with those of Chicago. However, in standardizing as thoroughly as they did, the Chicago engineers pointed the way for the larger standardization program which followed.



No one had more to do with the development of the girder rail than Tom L. Johnson—above are some of his early specimens

Chicago's standard of construction for heavy traffic streets is typical of the type of track with a foundation that will last the life of two or three rails



The standard that eventually became widely used on heavy traffic streets in Chicago is typical of similar work in other cities, and follows the policy of building a foundation that will permit the successive use of two or three rails. It is practically the antithesis of some recent types of track construction where rail life is the keynote of the design, and the whole structure is scrapped when the rail becomes worn.

Another notable installation on a large scale was that in Toronto, where standardization was carried perhaps to a greater extreme than was done anywhere else.

The third installation that might be mentioned covers a slightly different field. The Eastern Massachusetts Street Railway was a consolidation of many small companies operating in and between some 50 towns in Massachusetts. During the rehabilitation about 400 miles of track was overhauled or rebuilt. The figures become imposing when we get down to such items as rail joints. About 150,000 joints were welded and ground. Of the total mileage only about 20 per cent was rebuilt with new rail, even though much of the track had light tee-rail. Some of the existing girder rail was in such condition that the ends had to be bent up vertically before welding. Most of the welding was done by the metallic arc process, and novel designs were tried and tested. The open track was put in good operating condition at a cost of from $1 to $2 per lineal foot, and about $5 a foot covered the paved track, exclusive of pavement.

As we take up modern methods we find that some of them at least have come into use more slowly than is creditable to the industry. For instance, there is a very general use today of treated ties, especially creosoted ties, but even now their use is by no means universal. It was in 1887 that STREET RAILWAY JOURNAL informed its readers that in London, England, ties were being made of creosoted fir. At the present time one of the chief duties of our Committee on Wood Preservation is felt to be the necessity of educating our way engineers and executives to the large money savings that can be made by the use of treated wood in the street railway industry.

About ten years ago, the Committee on Welded Rail Joints of the A.E.R.E.A. was created to co-operate with the American Bureau of Welding and the United States Bureau of Standards. Seven progress reports have been issued, the latest in May of this year. This committee was financed by cash grants from the association, from a number of street railways and manufacturers, and by contributions of material, labor, testing facilities, and expert advice from a large number of manufacturers, universities and individuals. The reports give figures of tests on all the types of welded joints in general use, as well as a number of experimental types. They also show photographs and diagrams covering preparations of joints, testing machines used, condition of joints, after testing to destruction, results of tests, photo-micrographs, etc. The reports are evidence of the value of this type of industrial research.

Through similar co-operation, a committee of the Ways Division of the A.E.R.E.A. has been studying the subject of welding both in connection with welding rail joints and building up of special trackwork. Much progress has been made, and the building up of manganese, as well as carbon-steel surfaces, is now the general practice throughout the country.

Going still further in this line of research, studies of the use of special steels both for rail and special track work are being made. The use of intermediate manganese rail as rolled for steam railroads is being experimented with by electric railways. This rail contains about ½ to 1¼ per cent manganese, or from ½ to twice as much manganese as is specified for the standard carbon steel rail. Mention might be made at this point that steel with manganese content of about 12 to 13 per cent was invented by R. A. Hadfield, the great iron master of Sheffield, England, and was used with hard center special track work in about 1895. Many attempts have been made to find substitutes having equally valuable wearing properties, with the additional advantage of easy welding qualities. As yet there has been no general substitution of other alloys for manganese.

STUDY OF RAIL CORRUGATION

We are all familiar with David Harum's famous statement that a few fleas are good for a dog. Most of us have also heard the dictum that every enterprising business organization needs at least one thorough-going pessimist. In the track maintenance game the place of these two nuisances is taken by the problem of corrugated rail. Theories for cause of it have been announced a number of times, but any given theory is sooner or later disproved. In fact, corrugation is so utterly mean and cantankerous an occurrence that it will even disappear out of pure spite as witnessed in the following account from the City of Brotherly Love.

> Many theories have been evolved to explain the cause of corrugation, and I guess everyone interested has at least one of his own. One incident clings to my memory, which I believe cured my theorizing. It was suggested that the cause was the piling up of metal in the rail head in front of the wheel, due to the overstressing of the upper fibers in the head. If such were the case, it could be determined by measuring carefully the height of the rail at several points before and after corrugation. We selected a particularly troublesome location on a curve of long radius, which carried traffic at high speed. This curve would invariably develop heavy corrugations shortly after installation. We took a new 30-ft. rail curved to the proper radius, and in the middle of the base, and copper plugs were inserted at intervals of about 2½ in. to provide non-corrosive measuring points. The height of the rail was then carefully measured at each of these points with a micrometer caliper. The old corrugated rail was then removed and the new rail installed, care being taken not to disturb the ties or paving any more than was necessary. We waited considerably longer than the normal time for corrugations to appear at that location, but nothing happened, nothing ever did happen, and if my memory serves me correctly, the rail wore out without appreciable corrugation. Thereupon I stopped theorizing and devoted my energy to the more practical work of removing the trouble as it developed.

Although in some cities the cost of paving is nearly equal to the expense of all other way items combined, yet a small portion of our literature is taken up with its discussion and very little time and thought is given to it, if we can judge from the relative number of pages in the A.E.R.E.A. Proceedings. Paving seems to be like a disease that is not proper to discuss, and must be kept wholly within the family due to "local conditions." This is a pity, as more knowledge and more publicity would doubtless aid in helping each engineer to profit by the experiments and mistakes of others. Of course, we throw the blame for it upon the fact that usually the local authorities have control in the matter, and our arguments and prayers are of little avail. For example, granite, asphalt and concrete pavements are familiar in every city, but many times one of the three types will occupy 90 or at least 75 per cent of the track area, while in a neighboring city these conditions are entirely different. This is a subject that could profit from analysis of the results of experience more than any other in the way department.

In the Washington, D. C., standard, adopted in 1929, the concrete pavement is practically the sole support of the rails

The obligation of street railways to pave the track area came down from horse car days and varied in different cities and States. That it is an unjustifiable burden has been manifest by the relief granted in many cities. How extreme a load it was in some cities can be indicated by the burden carried by the Philadelphia Rapid Transit, many of whose franchises required paving the full width of the street. At one time it was responsible for maintaining 6,500,000 sq.yd. of pavement, equivalent to 300 miles of city streets from curb to curb, assuming an average width of 36 ft., or four traffic lanes.

The subject of modern track enters such a controversial field that it is impossible to cover adequately here all its phases. It is enough to note that there are two major types—the so-called one-life track, and the type that can be relaid without disturbing the foundation. The Chicago standard is a good illustration of the renewable type, while the track laid in Washington, D. C., in the fall of 1929, will serve to show the type in which concrete pavement is itself practically the sole support of the rails, as light steel ties act only as tie rods to maintain the gage, and to some extent reinforce the steel under the concrete.

No history of the work of way engineers for the past 50 years would be complete without at least one anecdote indicating the difficulties sometimes encountered in laying track. The following sketch, written by an engineer who has practiced on both the Atlantic and Pacific Coasts, gives a story that will bring a chuckle to the older members of the profession, many of whom can duplicate it with stories from their own experience:

> In building a track along a minor street on which there were several residential houses, some of the people objected to the line being on their street. One lady in particular refused to let us erect a pole in front of her property. We dug the hole about 5 ft. deep, and when we got ready to put the pole in she jumped into the hole. Of course, she could not get out, so we left her in there and built another hole beside the first one, installed the pole and then pulled her out.

PROGRESS WILL CONTINUE

And now, as the preacher would say, as his audience gets uneasy at the end of his harangue, please remember as you go out that the history of the past 50 years shows how gradual is our progress despite the fact that we have really advanced a great deal. To the younger men this should mean that no end can be set to the progress of the future, and that the opportunity for improvement is just as good for them today as it was for the old-timers of 50 years ago.

Valuable information in this article was furnished by the following, to whom acknowledgment is gratefully made by the author: C. A. Alden, E. B. Entwisle, C. M. Griffith, B. P. Legare, C. A. Smith, G. B. Taylor, F. B. Walker, and C. L. Wilson.

America's two pioneer installations of railroad electrification—the Nantasket Beach line of the New Haven and the Baltimore tunnel line of the Baltimore & Ohio—began service a day apart in 1895

Railroad Electrification of 4,500 Miles

A Notable Record of Progress

By

SIDNEY WITHINGTON

Electrical Engineer
New York, New Haven & Hartford Railroad

FROM the pioneer electrically operated locomotive cars to the highly developed, powerful electric locomotives of today is a far cry indeed. The earliest electric freight locomotive in this country, a 75-hp. unit built in 1888 for handling freight in Ansonia and Derby, Conn., and now preserved on the New Haven Railroad as a relic, presents an impressive contrast beside a modern electric locomotive. Yet from such crude beginnings the art of railroad electrification has grown. The progress which has taken place in but little more than two score years is one of which electrical engineers may well be proud.

The earliest "heavy" electric locomotive, exhibited at the Chicago World's Fair in 1893, weighed 30 tons and contained several features, such as gearless bipolar motors, quill-mounted on the axles, which have been retained in many modern designs. In fact, that locomotive, later purchased for the Manufacturers Railroad in New Haven, is still, with some modifications, in service in industrial switching after nearly 40 years.

Early development of the electric street railway industry provided an effective school for the pioneer projects in what may be termed "railroad electrification." In the year 1888-1895 street railways grew rapidly. As the service demands increased it was, of course, necessary to develop suitable power production and distribution facilities. When electricity was considered for steam traction problems, a not inconsiderable amount of development, not only in motive power, but also in power generation and utilization had taken place, and was available.

The two earliest steam railroad electrification projects were devloped nearly simultaneously in 1895. Each represented the solution of a typical railroad problem, although quite differently. The Nantasket Beach line of the New York, New Haven & Hartford Railroad between Nantasket Junction and Pemberton, Mass., near Boston, carried dense summer passenger traffic. The New Haven management was much intrigued by electric traction, partly on account of the obvious advantages of the then new form of energy, as contrasted with steam, and partly because of the growing possibility of local competition from interurban trolley service. It was felt that electrification of the Nantasket Beach branch, with 8 miles of double track, would provide experience of value in any subsequent development.

Power was supplied from a steam plant located at Nantasket, direct from the bus-bars at nominally 600 volts, in accordance with the then standard practice. The trolley wire, designed for heavy service, was a figure 8 section of approximately No. 000,000 size (330,030 circ.mil), and weighed about 1 lb. per foot; it was hung by direct suspension from brackets. Today it is amusing to note that the trolley wires and feeders were at first supported upon sawed pine poles without insulators, the wood being relied upon for insulation. Needless to say this was subsequently modified, though much of the original trolley wire is still in service. The motive power consisted of ten motor cars, each normally hauling four trailers. Since the service was a summer one only, many of the cars were of the open type, with steps running the entire length.

The Baltimore & Ohio Railroad originally ran around the center of Baltimore. Train movements had long been inconvenient because of the necessity of ferrying. When the development of electric facilities appeared to justify, the management took the oppor-

Typical installation of overhead catenary on the Pennsylvania Railroad between Philadelphia and Wilmington. The type now being installed on other sections is quite similar

At right—Double catenary construction was a feature of the original New Haven electrification out of New York

When the Great Northern rebuilt its line through the Cascade Mountains, the electrification was revamped also and extended to cover a greater portion of the route

At right—Electrification has proved extremely successful in switching and yard service, as in the Bay Ridge extension on Long Island

One of the late Pennsylvania locomotives for high-speed passenger service. New designs are being constructed for both freight and passenger trains between New York and Washington

Trains are now hauled to a terminal under the heart of Cleveland's business district with electric locomotives

tunity to construct and equip a tunnel for electric operation under the city. The route electrified was about 3 miles, and the three 96-ton locomotives first acquired were by far the largest electric equipment constructed up to that time. Each had four 360-hp. gearless motors, mounted on the axles. The original contact device comprised a shuttle-like brass shoe sliding in an overhead inverted channel which consisted of two 3x⅜-in. Z bars riveted to an 11½x¼-in. cover plate. This contact arrangement has since been replaced by third rail at the track level. The power distribution was nominally at 600 volts.

Most recent of the New Haven's passenger locomotives are these motor-generator units, which run either on single phase or direct current

There has been some discussion as to whether the Baltimore & Ohio tunnel or the Nantasket Beach line of the New Haven could claim to be the first "steam railroad electrification" in this country. The first electric train order on the B. & O. is dated July 1, 1895, and commercial freight operation started on Aug. 4 of that year. The Nantasket Beach electrification, after an extended period of test, started "commercial service" on June 30, 1895, and so it may be said to have slightly but definitely antedated the B. & O. electrification.

The New Haven management was much pleased by the success of the Nantasket electrification, and embarked upon a program of electrification which included various parts of the system and somewhat diverse classes of service All of this was at 600 volts d.c. Some lines had overhead trolley (either in direct suspension or supported by catenary messenger), and some third rail. The handling of various classes of service electrically under differing conditions permitted the accumulation of much information of value in subsequent installations. The original third rail was in the form of a flattened A, installed midway between the running rails. The shape was chosen with the idea of shedding water and protecting from weather the wooden blocks which supported it. The contact surface was 1 in. above the track rail heads, which allowed the shoes to clear the rails at turnouts, crossovers, etc., but was not high enough to foul the equipment. This location without protection was found hazardous, and was later abandoned.

In the meanwhile, use of electric traction was rapidly growing in the urban, rapid transit and interurban fields. The invention of multiple-unit control had provided great stimulus. A number of steam railroads were confronted with problems for which the solution was obviously electrification, and when the development in the art justified, a very considerable degree of activity was manifest. This activity, for natural reasons, was at first concentrated in the vicinity of New York, with its problems of congestion and of terminal operation.

Steam railroad electrification in the vicinity of New York was inaugurated by the Long Island Railroad in 1905, from Flatbush Avenue, Brooklyn, to Rockaway Park, about 16 miles. Electrification on that railroad has been gradually but steadily extended, and now includes about 450 miles of track. This electrification, comprising as it does suburban service, utilizes largely multiple-unit cars, of which there are now 1,077 in operation. Through trains in the electric zone are hauled by electric locomotives. Distribution is by third rail at nominally 600 volts.

Close upon the heels of the Long Island Railroad in the vicinity of New York, the New York Central-New Haven Railroad electrifications into the Grand Central Terminal were inaugurated. These installations were primarily the result of legislation on account of operation in the Park Avenue tunnel. Electrification of the Grand Central Terminal presented the opportunity to enlarge its capacity greatly by creating two levels for the terminal tracks. This involved, of course, complete reconstruction of all the facilities, and included an enormous amount of excavation, all in solid rock, and all necessarily carried on without interruption of service.

The New York Central management chose power distribution at 600 volts d.c. A novel type of third rail was developed with the contact surface on the lower side to reduce snow and sleet difficulties and to allow as much protection from accidental contact as possible. The initial New York Central electrification extended from the Grand Central Terminal to Kingsbridge and to White Plains, N. Y. Subsequent extensions reach Peekskill on the main line, Yonkers on the Putnam branch, the Port Morris branch and the West Side tracks in New York. Nearly 400 miles of track are now included. The initial electrification was for passenger service only, including suburban trains and through trains in the suburban zone; both multiple-unit cars and locomotives thus were employed. Recently freight service has been added. The road now operates about 170 electric locomotives, of which quite a number are of the three-power type, and 355 multiple-unit cars.

The New Haven management, although obliged to run trains over the New York Central's third-rail tracks for about 12 miles, adopted single-phase alternating current, with overhead trolley wire. It was the intention that the New York suburban passenger electrification was but the beginning of an extensive program to include all types of service. The initial installation extended to Stamford, Conn., the end of the suburban zone. Extensions, however, were subsequently made to New Canaan, New Haven, and Danbury, and to White Plains, N. Y., and freight service was included. Now 150 electric locomotives and 301 multiple-unit cars are operated over more than 800 miles of track, including trackage rights over the New York Central and Long Island Railroads.

Terminal Electrification Develops Valuable Air Rights

An interesting feature of the Grand Central Terminal electrification has been the development of the air rights. The entire terminal area of many acres is now occupied by high buildings (one of 34 stories) erected over the tracks, and forms the center of one of the busiest sections of New York.

Meanwhile, the Pennsylvania Railroad had constructed and, in 1910, opened for service its passenger terminal on Manhattan Island, designed to serve also the Long Island Railroad, and had connected it with Long Island and New Jersey by tunnels. The tracks of necessity were electrified. All trains from the South and West change to

For the electrification of its West Side freight tracks in New York, the New York Central uses three-power locomotives that can run independently with Diesel oil engines

electric power at Manhattan Transfer. Construction of the coach storage yard on Long Island reduced to a minimum the expensive terminal yard space in Manhattan. This early electrification utilized third rail of the same design as that developed for the Long Island Railroad. In accordance with the Pennsylvania's comprehensive plan, this section is now being equipped with overhead trolley wire to carry power at 11,000 volts, connecting with the New Haven electrification and utimately with that to Washington.

The West Jersey & Seashore Railroad, owned by the Pennsylvania, electrified its high-speed line between Camden and Atlantic City in 1906, utilizing mainly third-rail at 600 volts. Of other somewhat similar installations made in various parts of the country during this period, one of the most interesting is that of the Southern Pacific Railroad at Berkeley, Cal., at 1,200 volts direct current.

Many Tunnels Electrified to Eliminate Smoke

For some time New York held the center of the stage, in this country at least, in railroad electrification. Nevertheless, a number of railroads in all parts of the country were watching the results obtained in New York. Long tunnels had for years been a problem where they created points of congestion for freight or where the smoke caused inconvenience to passengers. On this basis, the St. Clair tunnel of the Grand Trunk between Sarnia and Port Huron was electrified in 1908; the Cascade tunnel of the Great Northern, in 1909; the Detroit River tunnel of the Michigan Central, in 1910; and the Hoosac tunnel of the Boston & Maine in 1911. It is characteristic of the desire for experimentation that no two of these electrifications utilized the same system of power distribution.

Other than these tunnels and extensions of existing electric zones, there was not much activity in the field between 1908 and 1913, although some extensions were of considerable magnitude and the mileage of electrified track in this country was more than doubled.

A somewhat new problem was met in 1913, when the Butte, Anaconda & Pacific Railroad, an ore-carrying line in Montana, was equipped for electric traction. This problem was not one of a terminal, a tunnel or of dense traffic, but largely one of general economy. There were, to be sure, some heavy grades, but the locomotives were not equipped for power regeneration. While general economy may be said to have been the direct justification for this installation, the local conditions are not typical. Water power is unusually abundant and readily available in the Northwest. It is of interest as an indication of the continuing efforts at explorations in the field of heavy electric traction that the power distribution system adopted was one never before installed, 2,400 volts d.c. with an overhead catenary-supported trolley wire. The B., A. & P. now operates 123 miles of track electrically with 28 electric locomotives.

The years 1914 and 1915 witnessed two exceedingly important electrification projects. Both are over heavy mountain grades and both utilize regeneration, but except for this they have little in common. One is in the West and the other in the East; one utilizes power distribution at 3,000 volts d.c. and the other at 11,000 volts, single-phase. It is of interest that of these two important electrification installations utilizing regeneration on heavy grades, one should utilize hydro-electric power where the energy cost is, relatively speaking, a secondary consideration, and the other obtains power from a steam plant close to the coal mines where fuel cost, and therefore energy charges, are also relatively very low. The advantages of regeneration are in both instances, therefore, primarily not saving of power but are largely those of holding trains on long down grades.

These three-cab locomotives haul 9,000 tons of coal on the Virginian Railway

The first of these roads, the Chicago, Milwaukee, St. Paul & Pacific Railroad, started its electrification in 1915. This road crosses three mountain ranges, the Rockies, Bitter Root and Cascade Mountains. The controlling reasons for this electrification were the same as those for its neighbor, the B., A. & P.—namely, cheap water power and heavy grades—although other advantages also accrued, notably that of electrically holding heavy trains on long descending grades. The Milwaukee, being a transcontinental road, has been able to capitalize its electrification to some extent in capturing tourist travel, for the absence of smoke through the scenic mountain routes, electrified for more than 650 miles, with 880 miles of track, makes good advertising. Fifty-six electric locomotives take power at 3,000 volts d.c., from an overhead catenary trolley.

The second of the pair of roads mentioned, the Norfolk & Western Railway, commenced nearly contemporaneously with the Chicago, Milwaukee, St. Paul & Pacific Railroad, electrifying its coal-carrying route through the mountains of West Virginia. The initial project made unnecessary a very heavy expense for double-tracking and tunnel work. Extensions have been made from time to time, and that road now operates electrically about 210 miles of track. The sixteen locomotives are of interest on account of their size and also because the traction motors are of three-phase induction type, taking power from an 11,000-volt single-phase trolley through a phase-converter. By changing the number of motor poles, two operating speeds are obtained which are practically constant, regardless of the grade or load, whether on level track, up-hill taking power, or down-hill regenerating.

Pennsylvania Railroad Inaugurates Extensive Program

The period about 1915 also saw the inauguration of the electrification of the Philadelphia surburban service of the Pennsylvania Railroad. The Broad Street Station had become very seriously outgrown, and that road was faced with the alternatives of electrifying a large part of its suburban traffic or of spending a great deal of money to enlarge and modify the terminal. Operation of suburban trains to Paoli and Chestnut Hill by means of multiple-unit cars very satisfactorily solved the immediate problem and postponed for about fifteen years any necessity for terminal changes. This installation and its extensions, utilizing an 11,000-volt trolley, also provided an effective laboratory for developing subsequent comprehensive plans. Electrification of the suburban service about Philadelphia now includes lines to Trenton, Wilmington, West Chester and Norristown, 437 miles of track and 345 multiple-unit cars. The new underground Broad Street suburban terminal, made possible by elimination of steam from suburban service, has been completed in connection with the comprehensive changes at West Philadelphia, releasing much valuable land in the heart of the city. Air rights over this terminal are of great value.

Following the installations of 1915 and 1916, there was little activity in new projects for nearly a decade; although some extensions of existing electrifications were made both geographically and in service. The New York Connecting Railroad was electrified from the New Haven system at the Harlem River to the Pennsylvania system at Sunnyside, L. I., to permit through passenger train interchange between the roads. In 1925 two notable electrification installations were made, one by the Virginian Railway and the other the Illinois Central.

The Virginian electrification, like that of the Norfolk & Western, carries very heavy coal traffic over mountain grades. The concentration of power demand in a single electric train on the Virginian is probably the greatest up to this time in railroad service. Trains of 6,000 and 9,000 tons are normally handled. The three-cab Virginian locomotives weigh more than 1,000,000 lb. apiece! As on the Norfolk & Western, regeneration is employed on descending grades. The Virginian power distribution is at 11,000 volts, single-phase, and 230 miles of track are electrified; the electric motive power of the road consists of fourteen locomotives.

The Illinois Central electrification at Chicago was inaugurated in 1926, primarily for suburban passenger service, although some freight and all yard switching on the Chicago terminal tracks north of Roosevelt Road are included. The distribution of power is by means of catenary-supported trolley wire, carrying 1,500 volts d.c. The road now operates 280 multiple-unit cars over 154 miles of track. Of ten locomotives operated, six are equipped with oil engines. This electrification was carried out in accordance with the terms of an agreement with the city of Chicago.

At about this time, also, the Baltimore & Ohio Railroad electrified its Staten Island rapid transit lines, in compliance with legislation of the State of New York. Some 50 miles of track are electrified, and 90 miltiple-unit cars are operated.

Many Extensions Made

From 1926 to 1930 activity was largely confined to extensions of existing electrifications. The most important project in that period was perhaps that of the Great Northern, which in connection with its new tunnel in the Cascade Mountains and the extension of its electrification in 1927, changed its power system to 11,000 volts, single-phase for a total of 93 miles of track. Nine locomotives are employed, all of the motor-generator type, supplying direct current for the traction motors from the alternating current supply. These locomotives are equipped for regeneration of power, although like the C., M., St. P. & P. electrification, the water power is in itself relatively very cheap. Electric braking on long down grades is the important consideration.

In 1927 the electrification of the Long Island-Bay Ridge section and the New York Connecting Railroad freight tracks, from the New Haven at the Harlem River to the float bridges at Bay Ridge, was inaugurated. This allows through runs of electric freight trains between Bay Ridge and Cedar Hill. Physically, this electrification is an extension of the New Haven, from which it takes single-phase power at 11,000 volts. The Long Island acquired seven single-phase freight locomotives to handle its service in this section. About 100 miles of track are involved in the project.

Last Two Years Notable in Heavy Traction

The years 1930-1931 have been perhaps the two most notable in railroad electrification since the pioneer efforts. Four important installations contributed to the progress of these years: the Cleveland Terminal, the Delaware, Lackawanna & Western suburban electrification in New Jersey, the Reading suburban electrification at Philadelphia, and, above all, the Pennsylvania's program between New York and Washington.

The Cleveland electrification, completed about a year ago in connection with the new union terminal facilities there, comprises about 60 track-miles over a 17-mile route through the center of the city. Three railroads utilize the facilities: the New York Central, the Big Four, and the Nickel Plate. Trains are handled through this terminal by 22 electric locomotives. The distribution system is 3,000 volts d.c. by overhead trolley. The controlling reason for this electrification was the development of air rights over the terminal tracks, which ultimately will be of grerat value to the owners.

The D., L. & W. electrification, which handles most of the suburban service out of Hoboken, was inaugurated last year, and is on the basis of 3,000 volts d.c. About 158 miles of track are equipped, and 282 multiple-unit cars have been provided. The reason for this, as with most suburban electrifications, was primarily congestion.

The Reading Railroad suburban electrification at Philadelphia, inaugurated in the summer of 1931, is at 11,000 volts, single-phase. This comprises about 161 miles of track, with 70 multiple-unit cars.

The Pennsylvania's program, already referred to, is by far the most comprehensive in the United States. Trains will be operated electrically between New York and Washington. This is of especial interest as it is one of the few electrification projects based entirely on broad economies to be derived as compared with steam, under very dense traffic conditions.

Electrification Should Have a Notable Stimulus

About 4,500 miles of track have been electrified in this country, an average of nearly 200 miles a year for the past 25 years. The adoption of electricity in industry being now prominently before the country, it may be expected that, as soon as there is indication of economic stability in the railroad industry, further advantage will be taken to increase efficiency by this means, and that it will have a notable stimulus. Universal railway electrification is not immediately on the way, however, for under present conditions the necessary facilities add very considerably to capital costs, and only under certain circumstances are the direct operating economies sufficient to offset the added capital charges and incidental expense. There is some danger of irresponsible legislative action in compelling railroads to electrify. Enough data are available to determine just when there is justification for electrification in any individual instance, and legislative coercion cannot in any way be justified, because forcing by such means of electrifications which may not be economically sound would inevitably tend to defer decisions in favor of projects which may be entirely desirable, and would thus injure not only the railroads themselves, but the communities which they serve.

The Transition Period in Street Car Motive Power—1890 to 1902

Figures of car and track mileage for the various types compiled by the Journal shows the phenomenal rise in the use of electricity and the steady diminution of other motive powers in the period.

Year	Electric		Horse		Cable		Steam and Miscellaneous		Total	
	Cars	Miles	Cars	Miles	Cars	Miles	Cars	Miles	Cars	Miles
1890	5,592	2,523	21,970	5,400	3,795	510	751	604	32,108	9,037
1891	8,892	4,061	21,798	5,302	4,372	594	815	642	35,877	10,599
1892	13,415	5,939	19,315	4,460	3,971	646	698	620	37,399	11,665
1893	17,233	7,476	16,845	3,497	4,805	658	616	566	39,499	12,197
1894	22,849	9,008	11,507	2,243	4,673	662	2,639	614	41,668	12,527
1895	27,720	10,363	9,522	1,914	4,798	632	2,705	609	44,745	13,518
1896	34,971	12,133	5,383	1,219	4,871	599	2,957	519	48,182	14,470
1897	38,536	13,765	5,144	947	5,199	539	2,653	467	51,532	15,718
1898	44,343	15,672	3,103	654	4,701	460	2,402	505	54,549	17,291
1899	50,658	17,969	1,489	416	4,250	403	2,339	425	58,736	19,213
1900	55,084	19,314	1,456	370	3,517	330	2,761	428	62,818	20,442
1901	62,591	22,063	1,411	332	2,543	241	2,332	400	68,877	23,036
1902	65,583	25,789	1,303	273	2,396	229	826	138	70,108	26,429

Power Generation

By

CHARLES RUFUS HARTE

Construction Engineer
The Connecticut Company
New Haven, Conn.

Early power stations sprawled out over a large area and belched smoke from many tall stacks. Contract the attractive modern susbstation in its setting suitable for a residential district

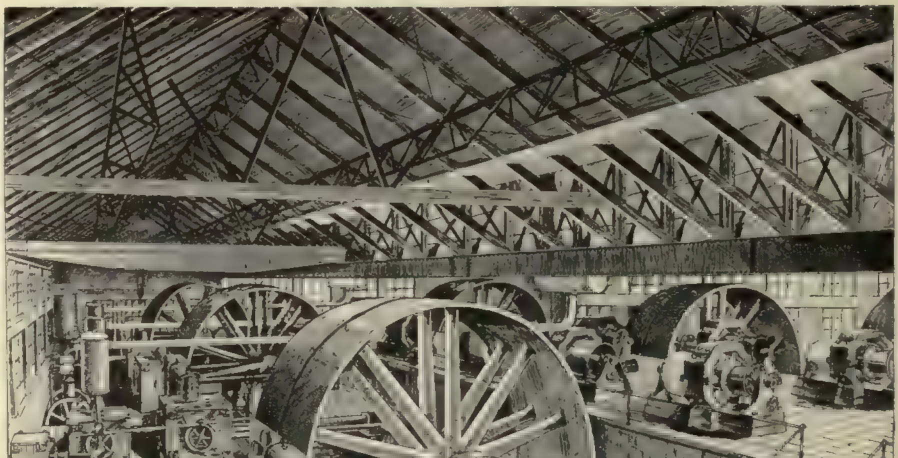
DEVELOPMENT of the power supply for the electric railway, and of the methods by which that supply is distributed to the cars, makes a story which to tell properly would take far more space than is here available. Only the high spots can be touched in outlining the steps which have brought us to the present state of the art; on the generating side, from the messy batteries of the experimental period, of but a few cat power, through the development of the direct-current generator from a mere toy to the great engine-type machines, the shift to turbine-driven alternators and conversion through rotary converters, to the present practice of leaving power generation to the central station companies, the railway owning only the conversion devices, either rotaries or mercury arc rectifiers, with a considerable proportion of the capacity in automatic substations. And if, on the side of distribution, there have been less radical changes, the many variations which have been tried out, in not a few instances with some temporary measure of success, make a story but little less interesting than that of the power supply.

The first experiments with electric traction, in the United States, those of Thomas Davenport, were made at just about the time—1832—that the first American street railway was put in operation in New York City, and when, in 1835, Davenport demonstrated his car, first in Springfield, Mass., and then a little later in Boston, the only street railway had been abandoned, not to be revived again until 1852.

It was, therefore, with reference to its application in railroad rather than in railway practice that Davenport and his immediate successors worked on the idea of electric traction, and they naturally followed railroad practice and used a locomotive which at the first carried its own power plant in the form of a primary battery. Fragile, slopping acid at every jolt—of which there were many—and otherwise misbehaving generally, these batteries were an unmitigated nuisance until Colton and Lilly in 1847 shifted them to a fixed position beside the track, and utilized the rails of the latter as the two sides of the distribution system by which current reached the motor. While this obviated many of the mechanical difficulties it did not, however, touch a very fundamental one, the exceedingly high cost of electric current so generated, and this remained an unanswerable argument against electric traction until the direct-current generator had become a commercial success.

The early generators were bipolar, requiring very high armature speed and close regulation. For driving them there were available two types of engine, the very compact short-stroke high-speed simple machines, of which the Armington & Sims, Ball, Buckeye, Ide, Porter & Allen, and Westinghouse were typical, and the sprawling long-stroke slower ones, both simple and compound, chiefly of modified Corliss type, the majority in any event being operated non-condensing.

At first, the speed required made



Great advances in compactness were made about 1890, as in the power station of the West End Street Railway of Boston, illustrated here

and Distribution

Have Undergone Many Changes

desirable, and in many instances necessitated, the use of countershafting, often fitted with clutches and quills to permit selective driving. The disadvantage of the friction losses was offset, in part at least, by the cushioning effect of the two belts, for the character of the load and the small size of the generators subjected them to frequent and heavy jolts. This arrangement necessitated a long engine room, even when, as was frequently done, the engines were placed on one side, the countershafting on the other, and the generators, belted back from the counter shaft, in mid-floor. It was necessarily wide if the plant was of any size, for the generators were very small, rarely of 100-kw. capacity. But since the big pulley wheels of the slower-speed engines had nearly one-half of the diameter below the floor, not a great deal of headroom was needed. This was also true in the boiler room, at least as to headroom. The old standby, the horizontal return tubular boiler, still was supreme, and the shape and small size of the units made it entirely practicable to put the entire plant under one roof. With the tall steel or brick stack, for natural draft was practically universal, the general effect was of a toadstool upside down.

With the rapid growth in size of the larger systems the great area necessary became a matter of concern. Improvements in design soon permitted direct belting of the engine to the generator behind it, a gain increased by the use of a vertical engine, and by the use of devices which, by increasing the arc of contact, permitted much shorter belts. A notable instance of the last type was the West End's station at Boston with its (for that time, around 1890) enormous Reynolds Corliss triple-expansion 1,000-hp. engines belted through two sets of arc increasers below the floor up again to the generators, which thus could be close to the engine.

That there was not entire agreement as to treatment, however, is apparent from the description in *Electrical World* early in 1892, of a proposed model station for which there were recommended 400-hp. engines operating at 70 r.p.m., and driving through countershafting.

By 1890 developments in several directions, which had originated chiefly on the electric lighting side, were beginning to reach the stage where they became important in electric traction. Of these the direct-connected unit was nearest to practical application, and by 1892 it was in use in some plants. The multipolar generator with its slow rotative speed made possible, as a first step, the so-called engine-connected unit with crank shaft extended on one or both sides of the engine frame to take one or two generators. With one generator there usually was a sub-base to which were bolted both the engine frame and the outboard bearing for the extended shaft; with two, they customarily were overhung, one on each side. This was very shortly followed by the true engine type, with the generator carried between the main bearings of the engine, and between the cranks if there were more than one.

Of the overhung units, the vertical marine-type engines with paired 200-kw. generators used in Milwaukee in 1892 were typical. Of the true engine type, the vertical marine-type engines with 525-kw. generator serving also as fly wheel for the Fair Haven & Westville line of New Haven, in 1896, and the horizontal twin tandem-compound engines for the People's Tramway of Philadelphia in 1895 were characteristic.

At this time (1895), there was still some question as to the advisability of using direct-connected units for the smaller installations because of their very heavy and abrupt swings, but the older practice of starting all car runs from a common point and on the same instant was dying out. Schedules were being adjusted to keep all the cars from climbing the steepest grades at the same time, and power installations were being given a little surplus over the absolute minimum. By 1900 the engine unit was practically universal. Incidentally, it was very close to its peak. Large units still were built—notably, such machines as the 5,000-kw. Reynolds-Allis unit with two vertical and two horizontal cylinders for the Metropolitan Street Railway of New York City in 1901—but the reign of direct-current generation was practically at an end.

Mercury arc rectifiers are a feature of many modern substations

To understand clearly the next change it is necessary to go back somewhat. Early developments in lighting had been with direct current, and there was a tremendous investment in the heavy copper conductors and costly conduit construction necessarry in view of the low voltage used.

Soon improvements in transformers made possible a high-potential primary distribution with transformation to the working potential practically at its point of use. This innovation had the result of cutting the copper required to but a fraction of that under the other scheme, and apparently threatening over-night to render the latter obsolete. There not unnaturally began what later was to be known as the "battle of the systems," of which one of the first elements was a matter whose outcome was very different from that which was anticipated.

The State of New York, in 1888, passed a law changing its method of capital punishment from hanging to electric shock at high potential. Fear that this would greatly prejudice the cause of alternating current led to unwise attacks on the law and resulted in bitter feeling on both sides. The objections proved unwarranted, however, and the alternating-current system was vindicated, although for a short time several States threatened to pass laws restricting the use of alternating currents to those of low voltage. With these threats out of the way, development was rapid; at the Chicago World's Fair of 1893 there was exhibited a complete polyphase system, the elements of particular interest to the railway man being the generator, step-up and step-down transformers connected by a shunt transmission line, and a rotary converter feeding a railway motor.

The first application to electric traction was early in 1894, when three-phase current, turbine-generated at Baltic, Conn., on the Shetucket River was transmitted at 2,300 volts a distance of 4½ miles to Taftville, just outside Norwich, to synchronous self-starting motors, one of which was belted to a railway generator feeding the Norwich Street Railway. There followed three very important developments. First, one minute after midnight of Nov. 16, 1896, Buffalo received Niagara power for its railway system, one instance, if not the first, of the dominant tendency of today, the purchase of railway power from a central station company.

Second, it was now practicable to concentrate power generation at the most desirable point for that purpose, and to transmit to substations most economically located for feeding, greatly improving operating conditions, and often permitting the shut-down of small outlying stations with high generating costs; while by tying together the better plants the loads could be most efficiently handled.

Finally, although this did not at once appear, it led to the abandonment of direct-current generation.

The steam turbine, promising much in some directions, gave little hope for traction purposes, so long as direct-current generation was the main dependence, although some little success was had in comparatively small sizes using reducing gear. Success of polyphase operation with rotary converters changed the situation completely. It proved entirely practicable, although at first by no means a simple matter, to build alternators, particularly well adapted to turbine drive, and for the second time the existing stations became obsolete.

With the transition to direct-connected units and their growth to large size, the old large-area low-roofed engine room had to be replaced by one of far greater clearance. The tops of the cylinders of a 6,000-kw. vertical engine-type generator are fully 50 ft. above the floor, the armature frame projects some 20 ft. below it, there must be sufficient clearance between cylinder tops and crane to permit handling the parts of the engine and then room for the crane above that. But the floor area, at least for equal capacity, was very much smaller. Also, the trend toward mechanical coal and ash handling equipment and to the use of water-tube boilers with automatic stokers and overhead bunkers called for an equally high boiler room. On the other hand, mechanical draft tended to the use of comparatively short, large-diameter stacks, completely changing the appearance from that of the station of the belted age. Incidentally it will be noted that this gave the building of the latter only the efficient service life of the equipment it contained, for having been built for special service it was not at all well adapted to most other purposes, and while it was used in some cases as a substation this usually proved unsatisfactory unless a great deal of reconstruction was done.

The shift to the turbo station involved comparatively little change on the boiler side except to necessitate greater capacity in many instances, but it called for radical changes in the engine room. The turbo alternator itself is very much smaller than the corresponding capacity in an engine type unit, it is true, but, on the other hand, it requires much more room for its auxiliaries, which are preferably directly below it. While the shell of the second-period station could sometimes be utilized, so much was needed in the way of internal change that it usually amounted substantially to rebuilding it if it was not decided to rebuild completely, thus securing all the advantages of a new station rather than spend but little less and probably have to forego the benefit of some of the latest ideas. Again the life period of the building was that of the contained apparatus, but this time with less salvage; for the tendency to outdoor substations took away a use to which the belted station building frequently though generally unwisely was turned after it ceased to serve as a primary station.

While in the main the generating systems have kept as near the front in power generation as their load and financial conditions would permit, for at least the last decade the chief advances have been made by the central station companies. Theoretically, the advantage of purchasing the power from such a company, with its diversified load in which the peaks which so seriously trouble the railway plant are of comparatively little importance, is so great that there can be no question as to the wisdom of so doing. Practically, this is not entirely so.

There is a sense of security with an owned plant which it is hard to realize when the other fellow has control, and there have been whispers of instances where what seemed a highly advantageous contract was found to be not quite so satisfactory later, a discovery oddly enough made by the power company, soon after the railway plant was dismantled.

Whether or no such things have happened in the past, there is no question but that the chances for such sharp dealing are steadily diminishing if they have not vanished as a result of present-day public regulations, and it is but a question of time and not a very long time at that before railway generation will be very much the exception. For that reason, the advances of the last ten years in this field hardly belong in an outline such as this, particularly when it is necessarily so sketchy.

The story of the substation is one of about as radical change as that of the main stations. Difficulties experienced with the first rotary converters, and an unwarranted belief that they were at their worst (and a very bad worst at that) on 60-cycle current, led to the use of motor-generator sets, particularly if a lighting load in the same transmission line made 25 cycles undesirable, but as the various "bugs" were eliminated, the advantages of the rotary soon put it well ahead of its bulkier and as a rule less efficient rival, a supremacy it has held until the recent development of the mercury arc rectifier.

At the outset the entire equipment was looked upon as of frail health, and it was sheltered and housed in with the greatest care. Gradually it became evident that part after part could be put out-of-doors, even when subject to our Northern winters, until today only the more delicate control apparatus is housed.

With these discoveries came first the thought and then the demonstration that all but emergency operation could be done automatically, so that now the power systems of more and more of the railway properties consist only of one or more main substations, receiving current from a power company, each with a very small operating staff supervising rather than controlling a series of substations in which operation, including first-aid treatment in case of trouble, is entirely automatic.

The first distribution system consisted of the two track rails, and this plan, later modified by adding a third rail for the feeding side of the circuit, and the track rails for the return, was followed in experiments made until 1875, although in 1855 one Bessolo had suggested the possibility of using an overhead wire, and as the possibility of electric street railway operation approached probability it became increasingly evident that the open third rail would be impossible for such service. In the latter years, George F. Green, of Kalamazoo, Mich., used an overhead wire with track return on a model he built. In 1882 Finney operated a car at Allegheny, Pa., using a trolley which traveled on top of an overhead wire, and was connected with the motor by a flexible cable. Credit for the first really successful overhead system, however, apparently belongs to Charles J. Van Depoele, who had constructed and operated a small experimetnal line at Chicago in the winter of 1882-1883, and who, in 1885, successfully operated a train at the Toronto exhibition, using an under-running trolley. In the next two years he first tried over-running devices consisting of one or more wheels on top of the wire with one or two pairs of wheels gripping it from the side, but by 1888 he apparently had settled on an under-running trolley wheel at one end of an arm carried on top of a post so it could both turn in a horizontal plane and tilt vertically, with springs at the lower end to keep the wheel against the wire.

Sprague, in his Richmond installation, used a wheel at one end of an arm which had the other end set in a stiff spiral spring, giving it motion in all directions, while Daft, who had both sides of his circuit overhead, used a four-wheeled car riding the two wires, on which it was held by the deep grooves of the wheels and the weight of the towing rope and the cable down to the car. This plan was followed by several other experimenters of the time who had both sides of the circuit overhead. Bentley and Knight on their overhead section at Allegheny put the two wires in a vertical instead of a horizontal plane and used two separate little cars, the cable from the upper car being attached to the lower car as well, and both cables twisted together from this point to the car. It was the use of these little over-running cars or "trolleys," which gave the electric car its nickname. An unfortunate tendency on their part to jump the wires and come down, coupled with the serious complications at crossings of two lines resulted in their early abandonment in favor of the under-running device, usually with a wheel, although Prof. Sidney H. Short used a shoe on at least one of his lines, in 1889.

With but one exception, operation was as at present on a parallel circuit. Professor Short, beginning in 1885, for several years most vigorously urged series operation, and actually installed and operated several lines. This plan necessitated sectionalized double wire and complications and the fundamental error of the scheme resulted in its ultimate abandonment.

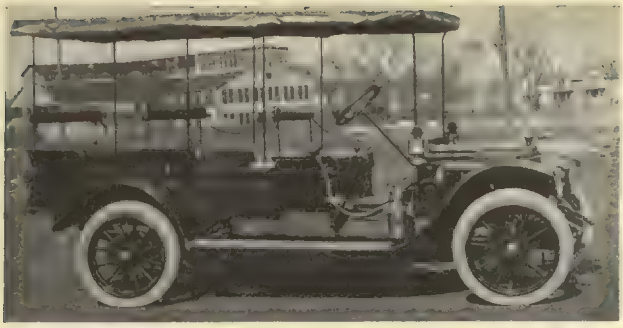
Using over-running devices, some form of goose neck support was necessary to allow passage of the collector, but above this support the overhead in many respects was quite like that of today. A report on perfect overhead, read before the American Street Railway Convention of 1892, at Cleveland, points out two differences, in its recommendations—that the No. 4 silicon-bronze to be used for trolley wire should have twisted splices, with approaches formed of cone-shaped tubes soldered over each end after twisting; and that there should be two guard wires at least 3 ft. apart, and 4 ft. over the trolley. It added a principle which is basic today, although too often disregarded: "Trolley wire hangers and pull-off brackets should be of the lightest make possible and still have the required strength and the very best insulation."

It is interesting that, as regards simple suspension, the devices of today differ from those of the very early period almost entirely in refinements rather than in anything really basic.

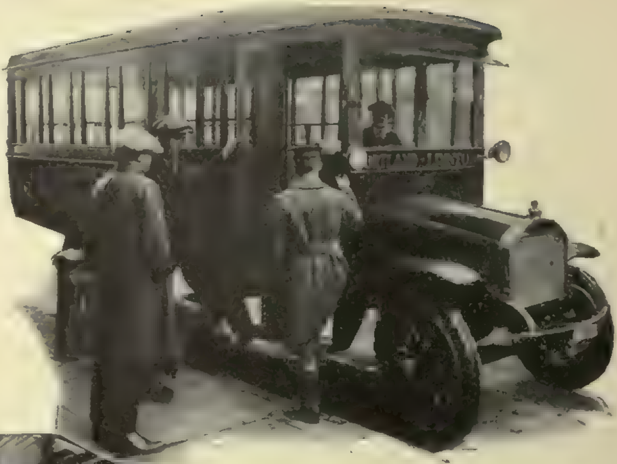
One of the earliest instances of catenary was apparently the Short installation on the Columbus (Ohio) Consolidated Street Railway, a picture showing ornamental gas-pipe bridges spanning from curb to curb "at intervals of about a block," while a messenger attached to the bridges carried droppers, each holding a cross bar with the support for the two trolley wires. The peculiar requirements and conditions of heavy traction service have necessitated some changes, but for the lighter wheel operation the simple hanger of the early period, after going through may elaborations of attachment to trolley wire and to messenger, has come back to the simple screw clamp ear used by Charles L. Henry on the Cincinnati single-phase line, with, however, a loop instead of the rigid clamp for the messenger. And with all the variations in the heavier service, the real advance was the plan first suggested by E. H. McHenry, of a duplexed trolley, the clamp connecting the two coming midway between the dropper attachments to the upper one.

Much more might well be said of the closed and slotted conduit and the stud systems at one time in use, and of the compressed air, superheated water, spring, gas, naphtha, carbon dioxide, and ammonia motors which were tried, but a mere outline would extend this article too greatly. After all, the great question of today is less about past history than future possibilities.

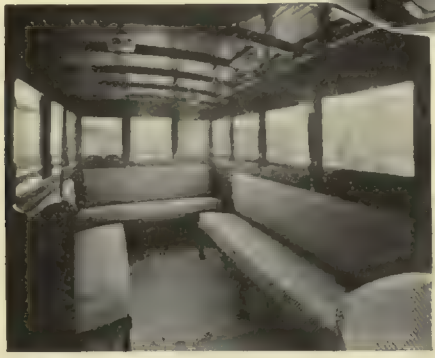
Complicated track layouts require careful treatment of the suspension fittings to produce good appearance of the overhead



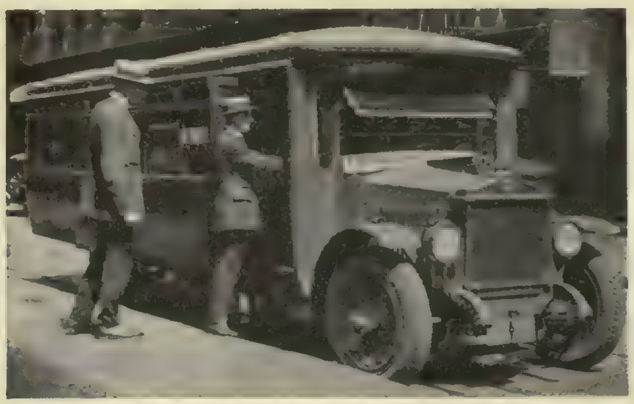
A 1909 White bus—a far cry from the comfortable and commodious vehicle of today



Some Steps in the Development of the Motor Bus

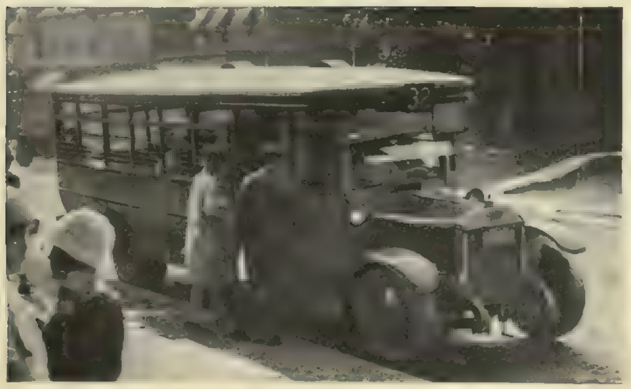


Back in 1917 this was the last word in bus design. At left—Bare floors and uncomfortable seats were characteristic of the early buses

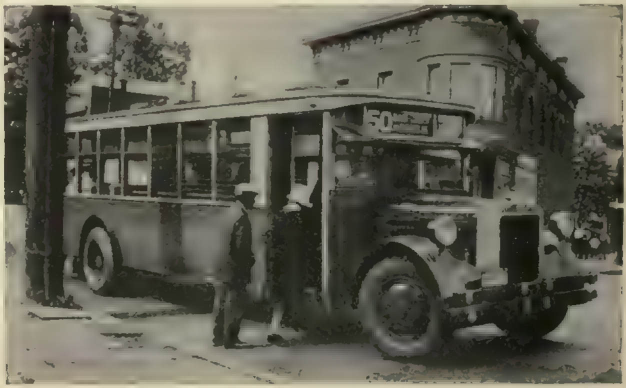


Imperial Omnibus—the original low-level bus—built in 1921

25-passenger Mack, a type brought out early in the last decade



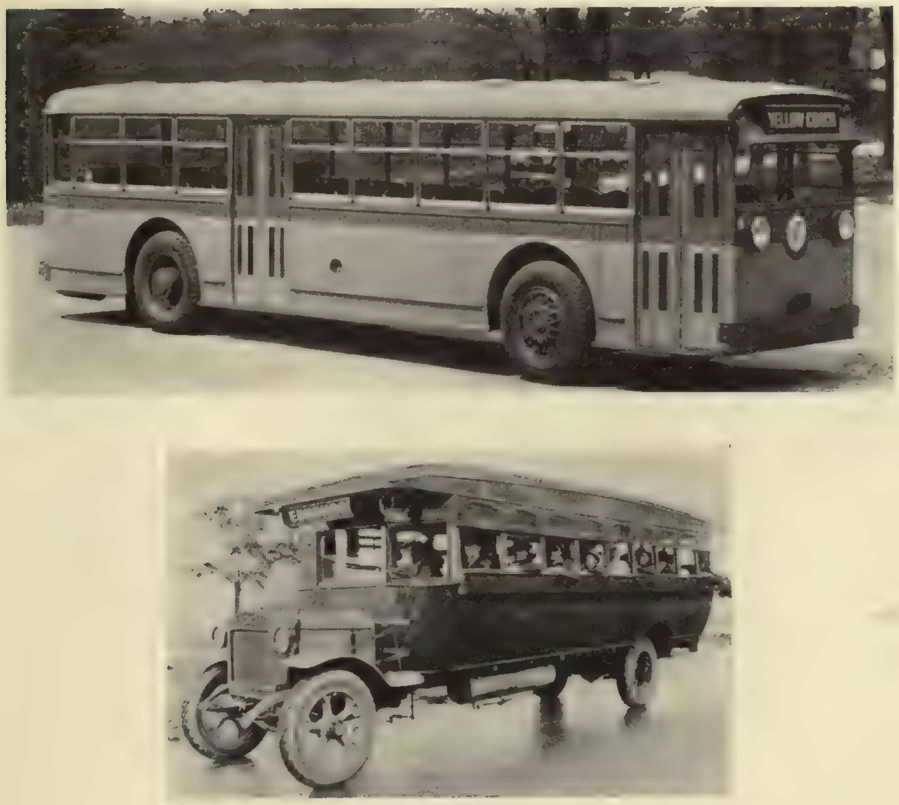
Recent 33-passenger gas-electric A.C.F. bus



By **CARL W. STOCKS**
Editor
Bus Transportation

The Modern Motor Bus

Reveals the Ceaseless Effort to
Improve Design



Ten years of progress—the 40-passenger Yellow Coach brought out in 1931 alongside a G.M.C. bus of the vintage of 1921

INTERESTED observers marvel at the rapidity with which changes in bus design have taken place during the past decade. Obsolescence, while rapid, has reacted favorably to the public, and forced many operators to keep their vehicles up to date in order to hold a place in local transport. It is perfectly plain that there has been a tremendous increase in the use of buses, but with each new use have come new features in design and new problems to be solved.

The automotive engineer has been quick to sense the necessity for revisions in design to meet these problems and at the same time to satisfy the operator's demand for greater capacity, for more power and higher acceleration, for better braking ability and for longer life of parts. In each instance the manufacturers, co-operating with the bus companies, have increased the reliability of bus service and enabled them to meet higher operating costs without an upward change in the fare structure.

Bus operators therefore are in a fortunate position. They now have far better vehicles than at any previous time in the history of the industry, and by prudent selection can fit these vehicles to routes for efficient operating performance according to known service characteristics.

Motor bus development was accelerated by the "jitney," where the passenger automobile was applied to commercial passenger traffic. As a medium for handling mass transportation in cities, however, the jitney was a failure. But it was not without its lessons to those who were willing and able to analyze the problem and the kind of service that was given. The wide use and popularity of the jitney indicated the need and demand for a flexible highway service. The wholesale failure of jitney operators gave sufficient evidence that the character of the vehicle used by them was not designed for the volume of traffic handled and the service chractertistics encountered. And further, the operators were not experienced in transportation problems. The jitney therefore can be looked upon only as a transitory vehicle, but its operators must be acknowledged as the forerunners of a more responsible organization which was necessary to put bus operation on a profitable basis.

The next step in the growth of highway transport was the use of standard motor truck chassis with bodies designed for passenger service. Operators of this type of vehicle met with fair financial success in many cities and suburban localities. In design these vehicles were more or less of a makeshift in the light of present-day development, but they did fulfill remarkably well the immediate need in the trackless transportation business. It was not, however, until vehicles were designed from the ground up that the permanent success of motor bus operation became apparent. In these designs safety, comfort and efficiency of the vehicle itself were considered as vital points in operation. A study of the fundamental factors from an operating standpoint indicated that a specially designed chassis was a necessity to insure economical and profitable motor bus use. The converted motor truck never made the ideal motor bus. It failed in power requirements and in riding comfort.

Safety, early recognized as a vital factor in bus design demanded a low center of gravity. This in turn brought about a lower floor level, the use of a wider tread rear axle, the use of underslung springs on the rear axle, and ultimately a kick-up in the frame, the use of the inverted worm and the drop type of front axle.

Lowering the floor level also made possible a reduction in the step height at the door, an important factor in speeding up loading and in reducing boarding and alighting accidents. The low step construction and floor level, which is now a feature of all bus designs, is an essential of comfort as well as safety and loading efficiency, because buses at the curb can make a quicker pick-up and discharge.

The originator of the low level, low center of gravity, wide tread, underslung type of chassis was the Trackless Transportation Company, which, about 1921, designed the so-called Imperial type of omnibus. Since that time many of the ideas first incorporated in this type vehicle have become universal.

Developments in bus design have been faster by many times than have occurred in any other transportation unit. Reasons for this are attributed to the fact that the automotive industry, notably the truck builders, had the basic experience to facilitate this ultra-rapid progress.

The development of the steam locomotive has taken more than a century, and the development of the electric car is only now celebrating its 50th anniversary. Even the airplane has seen more than a quarter century of development, whereas the motor bus has made its greatest advance in design in the last decade. In the last five years, or since the widespread acceptance of the bus as a vehicle for urban transport by the electric railway carriers, developments in design for the city type bus have had their greatest acceleration.

The small bus is proving popular for certain kinds of service. The type shown is a Dodge parlor car

In the past seven years nearly 200 bus chassis models have come and gone. In the same period, 49 manufacturers have retired from the field. Some retired permanently, while others, for the present at least, are merely inactive in production. Of those companies that are no longer in production, much that is good can be said. All of them contributed in one way or another toward the advancement of engineering knowledge. Some made mistakes, and in so doing pointed the right path for others to follow. In many cases their mistakes were but one step removed from actual positive accomplishments.

MANY MANUFACTURERS IN BUS FIELD HAVE COME AND GONE

Of the companies that are still in production at this writing, seventeen have entered the field in recent years, while 22 date back to what may be called the infant days of the industry. However, the more potent among them —with a few exceptions—have sprung up since 1922, or have expanded and flourished through consolidations or the introduction of new management.

In the early days of bus use 16-passenger vehicles were considered quite the maximum that could be mounted on a chassis. Since 1922, with the advent of specially designed chassis and the more extensive use of truck chassis to meet the operators' demand for greater passenger carrying ability, the average capacity of the conventional type of single deckers has climbed steadily from 25 to 37. In 1925 came the development of the so-called chassisless automotive street car type of vehicle, which further increased carrying capacity to 40 and 42. Within the past year has come the Duplex city type coach with 61 passengers on a single floor, and this year the pusher type drive with engine mounted at the extreme rear and driving forward to the rear axle was developed.

Mention may well be made also of the double-decker, which has undergone change with but a single thought in mind, namely, increased carrying capacity. Where 37 passengers was once the rule, this has been increased to 67.

With the transition from 16-passenger bodies to units of larger size, which meant a longer wheelbase and a greater body overhang at the rear axle, weaknesses in fundamental chassis units began to develop. It was not enough to lengthen out the wheelbase; in fact, this only served to aggravate other troubles. Engines that had been of sufficient power to handle small buses soon proved inadequate to carry the larger passenger loads, especially since the number of standees frequently increased in direct proportion with the number of seated passengers. Springs and drive-line units were unsatisfactory for the same reason. On the other hand, safety decreased because of lack of adequate braking power and inability to secure proper steering qualities for these heavily loaded vehicles.

BUSES DESIGNED PIECEMEAL

Overcoming one set of difficulties often meant the outcropping of a new set. Reduction of floor level height in the interest of lowering the center of gravity for safety and for greater ease in boarding and alighting, brought about an epidemic of tire and brake troubles. Another deluge of troubles came from the urge on the part of the local carriers for improved interior lighting facilities. Everyone recalls the battery and generator troubles and discussions current six and seven years ago.

Increasing the capacity of the body likewise meant heavier and more rugged body construction, a fact that brought forth frame troubles. Attempting to build bodies sufficiently rugged to withstand weaving caused difficulties due to the outrigger method of mounting. The body and the chassis were in a constant battle. As one was strengthened it immediately set about destroying the weaker member.

To top it all, numerous mechanical difficulties were encountered due to legal restrictions imposed by states and cities. In many cases these restrictions still are a thorn in the side of both carriers and manufacturers. Variations in restrictions as to dimensions and weights have proved burdensome to the industry because they have prevented the full enjoyment of economies resulting from the use of a standard design.

In some few instances, however, it has been possible to capitalize the legal requirements. For example, the ordinarily useless rear safety exit has been made to serve a dual purpose. By putting it on the right side, instead of the left, it can be automatically controlled to serve as a rear exit at all unloading points. Use of a rear door permits the passenger load to circulate from front to rear and materially lessens the time of stops, thus speeding up schedules.

More Powerful Engines Developed

Ten years ago the four-cylinder engine reigned supreme in the city type of bus. In fact, it was not until 1926 that the six-cylinder engine attained a lead over the four, a lead which has been increased from year to year until the present time. Some few models are now even fitted with an eight, such as Studebaker No. 111, Yellow W and Flxible. Use of two six's in a single vehicle was originally announced in 1927 for use in a 40-passenger unit by Twin Coach. Later years have proved the popularity of vehicles of this size, which are now built by Yellow, Mack and A.C.F., although none of these employ more than one engine.

Power requirements of present-day engines cover a wide range. Small sixes rated at less than 50 hp. are available for service where loads are light, while the latest engines for recently developed large capacity vehicles are capable of delivering 175 hp. under actual service conditions. It is significant, perhaps, that the more recent models are designed to deliver a higher torque within the lower speed ranges. Furthermore, maximum engine speeds are held within reasonable operating limits, and because more thought has been given to the matter of proper rear axle reduction ratios it is possible to operate the engine more efficiently and with greater economy in so far as maintenance and increased life of wearing parts are concerned.

Steel bodies with automatic rear exit door were a new feature in 1928

From time to time numerous experiments have been made to use fuels other than gasoline for engine power, although the present low price of gasoline has tended to subdue the interest in these developments, at least temporarily, and for the time being there is no indication that motor bus manufacturers are contemplating abandonment of the time-tried gasoline power plant. The Diesel holds attractive possibilities and undoubtedly merits consideration for use under conditions where it can be operated almost continuously at full load. On the other hand, a number of engineers contend that the high compression required for the Diesel is not essential in operation where wide open throttle is needed only at rare intervals.

Present tendencies in engine design are toward refinements that promote smoother operation and better all-around performance without adversely affecting fuel economy and operating costs. Apparently it is the aim of manufacturers to make every drop of fuel count. This is borne out by the nature and extent of changes in carburetion and manifolding in current designs. On the more recent engines downdraft carburetion and in some cases duplex intake manifolds, are growing in favor. Marked attention likewise is centered on the exhaust manifold, the object being to secure quicker and more complete scavenging of the combustion chamber, of reducing back pressure and of promoting more uniform velocity of exhaust gases.

Interesting from the standpoint of efficiency and economy is the increasing use of materials designed to withstand better the severe demands required of the modern power plant. Nine engines out of ten now use silchrome exhaust valves to eliminate former common troubles due to burning, warping and pitting. Salt-cooled valves to promote more rapid heat dissipation also are increasing in popularity, particularly on overhead valve engines. Practically all cylinder blocks are nickel iron, and aluminum alloy pistons are gaining in favor as improved methods of heat treatment permit more accurate fitting.

Longer engine life, however, is not entirely due to use of improved materials; better manufacturing methods also are responsible. Machining of parts generally is being held within closer limits so that parts can be fitted with almost gage-block accuracy, a fact that accounts for the comparatively smooth and quiet operation of the present-day motor bus engine.

Improvement of the engine also has brought about similar betterment in the design of accessories and fundamental units. The fuel feed system, for example, has gone through a most interesting series of developments from the gravity feed to vacuum tank, and within recent years to numerous designs of mechanical and electrical fuel pumps. Gravity feed along with the thermo-syphon method of engine cooling went out of vogue on buses several years ago.

Battery ignition systems, used only on light-duty vehicles half a dozen years ago, now find almost universal applica-

The single-engined 26-27 passenger Twin Coach—a recent development in bus design

tion in the motor bus field. Voltage regulation likewise has been generally adopted, especially in the medium and heavy-duty fields using 12-volt systems for starting and lighting. Every increasing demand for electrical energy brought about by the use of more electrically operated devices on buses, and also by the demand for better interior lighting, has led to almost annual increases in battery capacity. Obviously this means more weight.

Increasing the engine power has brought about the need for greater strength in the transmission units. Clutches of multiple-disk design are now the rule except for light-duty vehicles. Improvements in the gearset have been made largely with the object of reducing noise without sacrificing strength. And although substantially increased engine power is now available but little attempt has been made to reduce the number of forward speeds in the heavier designs. The four-speed gearset, because of the flexibility of operation it affords, is used on all but seven of the 89 models carried in *Bus Transportation's* most recent table of bus specifications.

As to the type of final drive, honors are divided between worm drive and the bevel and spiral drives, 32 of the current models being equipped with the former type of drive and 30 models having one of the latter types. More than twenty current models are using double-reduction final drive. In latest developments of bevel drives the gear teeth are made larger and stronger, and one of the more recent rear axle designs has only one tooth in contact at a time.

Aside from the engine the bus braking system has probably received the greatest attention. The braking system furnishes a splendid example of how changes in one fundamental unit often affect an entirely different unit. For example, the almost universal trend toward the drive-shaft brake some years back was brought about by the manufacturers' efforts to secure a lower center of gravity through the use of smaller wheels.

A decade ago brake location was limited to the rear wheels, with a few makes using a combination drive-shaft and rear-wheel hook-up. During 1922 and 1923 the use of two sets of brakes on the rear wheels continued to increase, with the drive-shaft type dropping off slightly. It was also in the latter part of 1923 that four-wheel brakes were first used on buses. The following year nearly 5 per cent of the models were equipped with this innovation. It was also in this same year, 1924, that bus manufacturers began casting about for means to reduce over-all body height and hit upon the idea of using wheels of smaller diameter. Incidentally, it was these early steps that are primarily responsible for the low-hung, well-balanced bus of today. General adoption of drop frame construction, underslung frames and lower body sills were developments that came later.

The latest and earliest type of bus operated on Fifth Avenue, New York

Reduction in the size of the wheels brought about a new problem, namely, inadequate brake cooling. This form of trouble was most pronounced where two sets of brakes were mounted on the rear wheels. In seeking a way out of this difficulty the manufacturers began to look again with favor on the rear-wheel drive-shaft hook-up, with the result that 20 per cent of the models of 1925 were employing the drive-shaft combination and 70 per cent employed two sets of brakes on the rear wheels. Four wheel brakes had more than doubled in usage.

The year 1926 showed but little change from 1925. This was a year of extensive experiments on the part of makers of brake equipment and tire companies. The main objective was to eliminate brake heating conditions which had proved so destructive to tires, and at the same time to improve decelerative ability and generally to simplify brake design. What happened in the interim is a story familiar to all. Four-wheel brakes are now the accepted means of deceleration on all but a few models.

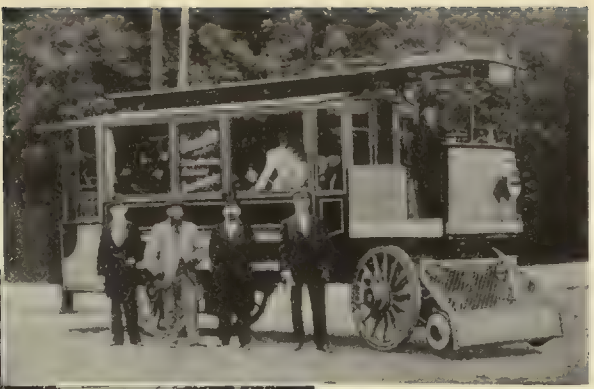
Brake actuation, as demanded by higher speeds, larger vehicles and heavy traffic also has kept pace with progress. Power brake appliances are now operated by air, by hydraulic pressure, by vacuum in the intake manifold, and to a lesser extent by servo multiplication of manually applied power. About 35 per cent of all current models are equipped with air brakes and about 25 per cent with hydraulic brakes.

The vicissitudes of the various wheel types is best indicated by the fact that wood wheels, with which nearly 60 per cent of early models were fitted, are now no longer used. And the cushion wheel, once proclaimed as the rival of all shock absorbers, is now but a memory. The disk wheel and the cast spoke wheel are now the only types found on buses.

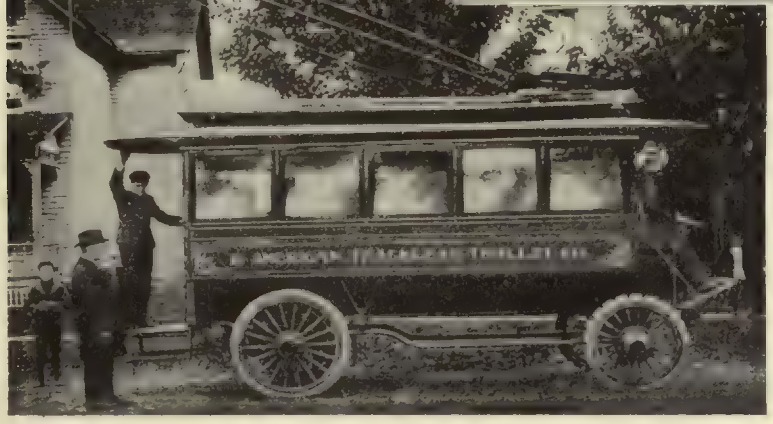
Dual tires on the rear wheels, at one time a theory only, have long since become a firmly established fact. So, too, with balloon tires. Since their first use on buses in about 1926 they have become universal, and high-pressure tires are now used almost as infrequently as solid tires.

So much for the developments that lead up to the present. What, then, does the future hold? Suggestions have been advanced which involve such radical changes as the use of radial or opposed engines, possibly the Diesel, installed under the floor of the bus; of a synchro-mesh transmission perhaps with free wheeling or even the elimination of any form of gearset; of power steering; and of means for steam heating and for better disposal of exhaust gases. There is also a necessity for close study of ways and means to reduce the gross weight of vehicles, both body and chassis. Otherwise power plants will have to be further increased in size if equivalent acceleration rates are to be maintained. These and many other improvements, according to some authorities, are either in course of development or are receiving serious consideration.

By
CLIFFORD A. FAUST
Assistant Editor
Electric Railway Journal



The first trolley bus in the world, built by Siemens and Halske, of Berlin, in 1899



Vehicle placed in experimental service in 1903, at Scranton, Pa.—a pioneer of its type in America

A New Vehicle with an Interesting Past—

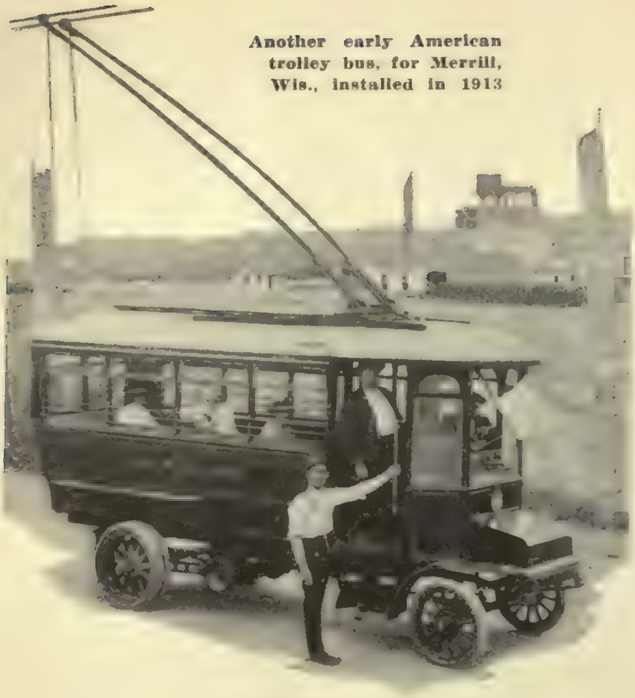
The Trolley Bus

IF YOU were waiting somewhere along the route of a modern trolley bus line and saw approaching you a vehicle with a bow collector, three-window street car body, a monitor deck roof extending forward several feet to cover the driver's high platform, four large wagon wheels and two small flanged wheels at the front, you would be greatly surprised, and rightly so, for you would be taking yourself back 32 years, to the year in which a vehicle of this description actually made its appearance in Berlin, Germany. Being the first trolley bus every developed, this vehicle, though possessing many of the essential characteristics of our present type, was a curious and very unusual contrivance.

The "combined trolley car and automobile omnibus," designed by Siemens and Halske, was fitted with a bow collector for operation on railway tracks and storage batteries for running on streets where there were no tracks. By using the trolley circuit in places it was possible to lower the storage battery capacity, thereby saving weight, to charge the batteries economically and also to reduce the tractive resistance. To keep the vehicle on the track when operating as a trolley car, use was made of two flanged guide wheels which ran in front of the front driving wheels. When the vehicle was turned off the track these guide wheels were raised and the bow collector tied down. The body resembled that of a horse omnibus of that period and had four main wheels, similar to those used on ordinary farm wagons. Brakeshoes of the type found on wagons were used, but these were supplemented with an electric brake on all four wheels for emergency use. Four motors of 4 hp. each were employed, one for each driving wheel.

Ingenious as was this vehicle in conception, it presents a striking contrast to the modern trolley bus. Its 12-passenger capacity has been increased to 43 for single-deck vehicles and to 61 in the case of the largest English double-deckers; the high floor and awkward-appearing body have been superseded by a low well-proportioned body with arched roof and graceful lines; the large steel-tired wagon wheels have been replaced by small-diameter wheels with big pneumatic tires; the bow collector has given way to twin trolley poles; the high semi-inclosed platform for the operator has been replaced by an operator's section inside the body; the motor capacity has been increased from 16 hp. to 100 hp., the hand controls have been superseded by pedal control, and the simple wooden brakeshoes on the two rear wheels have been replaced by combinations of internal expanding mechanical brakes, rheostatic brakes and vacuum amplification, all operated by one pedal. Besides these changes many improvements have been made in seats, flooring, body construction, electrical insulation and doors.

The smooth ride now afforded by the modern trolley bus, the pleasing appearance it presents and the high speed it can attain with safety are noteworthy evidence of the progress made. Only a



Another early American trolley bus, for Merrill, Wis., installed in 1913

vivid imagination could have conceived the enormous growth that was to follow the introduction of this type of vehicle back in 1899. Although the vehicle experienced several setbacks in the way of complete abandonment of some systems and designs, the present operations throughout the world are so extensive that it has become an extremely important factor in transportation service.

In America alone there are now eleven systems, operating a total of 199 trolley buses. These are, in the order of the number of units in service: Chicago, 114; Salt Lake City, 26; New Orleans, 13; Rochester, 12; Philadelphia, 11; Detroit, 6; Cohoes, 4; Knoxville, 4; Rockford, 4; Baltimore, 3, and Brooklyn, 2. Before the present year ends, six more cities are expected to install trolley bus systems. These cities and the number of vehicles to be used are: Kenosha, 22; Memphis, 9; Peoria, 5; Shreveport, 5; Pawtucket, 4, and Duluth, 2. Seven other cities in the United States have decided to use trolley buses and may announce definite plans at any time, while 26 other cities are known to be seriously contemplating installations.

England is by far the largest user of trolley buses. A recent survey by the JOURNAL showed that at the beginning of 1931, 24 systems in England and Wales were operating approximately 545 vehicles. Since this survey was made several of the municipalities have expanded their fleets, and three others have made first installations. The most notable is London, which expects to have 60 double-deck vehicles in operation before the close of the year.

On the Continent of Europe there are installations in Poland, Belgium, Italy, Denmark and Germany. In Africa there are two systems, in South America two, and in New Zealand one. In the Orient installations have been made in the Philippine Islands, Japan, the Dutch East Indies, the Straits Settlement and in China. The properties at Singapore and Shanghai, with 105 and 99 vehicles respectively, have what are believed to be the second and third largest systems in the world, being exceeded only by Chicago.

In the history of the trolley bus developments were gradual and steady from the very beginning. However, in the United States there have been two periods of special significance in its history, the one starting in 1921 and the most recent one beginning in 1928.

So far as can be determined the Siemens-Halske storage battery trolley bus, placed in operation in Berlin during 1899, was the first installation in the world. Early in 1900 the second installation of which details are known, was made in France by M. Lombard-Gerin. An experimental line, about 3,000 ft. in length, extended on a road along the Seine just outside the limits of Paris. In the design of this system a four-wheel over-running carriage was used on the overhead to collect the current. This carriage was driven by a little non-synchronous induction motor of the squirrel-cage type, supplied with 3-phase current from the motor of the main vehicle, and traveled at a speed slightly greater at each instant than the trolley bus itself. The trolley, with its motor, stopped when the principal motor stopped, and followed all the variations of the speed of the vehicle which it tended. The trolley, constructed entirely of aluminum alloy except the magnetic parts and weighing 40 lb., was connected to the vehicle with a cable of six conductors. Being flexible this cable permitted a wide touring range. To take care of operation on steep inclines, where the trolley would have a tendency to slip on the wires and drop back, an electromagnetic brake with shoes was attached to the trolley carriage and was controlled by a pedal in the vehicle.

Later in the same year, 1900, the Lombard-Gerin interests installed an experimental line at Vincennes Park during the Paris Exposition. Early in 1901, a similar system was installed at Eberswalde, Germany, near Berlin. After operating for five months it was abandoned because of excessive costs and insufficient patronage.

One of the notable installations in the early years was made in the Biela Valley, Germany, between Königstein and Königsbrunn, on July 10, 1901. This system, developed by Siemens and Halske and known as the Max Schiemann system, had an overhead structure very similar to that used today and had two separate trolley poles with shoes for current collection. Being an interurban line, trailers were added behind the passenger vehicles for the haulage of freight. This line remained in operation for three years, after which it was transferred to Wurzen, in Saxony.

In the period of activity beginning in 1921, Staten Island started a system with eight vehicles and later added fifteen more

What was probably the first operation of a trolley bus in America was the installation of a temporary line by A. B. Uphan of Boston, president of the Eastern Trackless Trolley Company, to demonstrate its practicability. The vehicle used resembled the lightweight street car of early days, had rubber tires, an outside platform for the driver, two motors and two trolley poles. The seating capacity was twenty. An interesting feature of the design was the use of trolley wheels in a horizontal plane, pressed apart and against the sides of the wire by a spring at the trolley base. Plans later were made by this company for installing a line in Franklin, N. H., between two railroad stations at distant points of the town, and in April, 1902, a franchise for operating the system was granted by the City Council. A little later announcement was made by two Lowell, Mass., capitalists that they were backing Mr. Uphan for a line between Franklin and Franklin Falls, N. H., and that permission had been secured to put systems in Lowell and other New England cities. Apparently, none of the contemplated installations were made. However, in 1903, the same company, with its name changed to the American Trackless Trolley Company, demonstrated its vehicle in New Haven, Conn., before a group of capitalists, who desired to try the vehicle in that city. Finally, on Nov. 2, 1903, the American Trackless Trolley Company formally opened an experimental line in Scranton, Pa. This line, 800 ft. in length, was run over private property and the ground covered was neither smooth nor hard, but exhibited conditions such as would be encountered on many country roads. The vehicle, as illustrated, used the horizontal trolley wheel idea, and apparently was the same one demonstrated on the two previously mentioned occasions. It was tested for a few months in Scranton and then abandoned.

In the meantime, during 1902, the Lombard-Gerin Company installed a 2.5-mile line with one vehicle at Fontainebleau, France. This system operated for 110 days, and provided valuable data for altering the design. It was similar to the original French systems, in that it used a motor-driven trolley carriage and flexible cable. Early in 1903 the A.E.G. of Berlin developed an interesting vehicle with six wheels, the two rear ones being replaceable by sled runners for operation in snow.

In 1904 a 2½-mile system with two short branches was installed between Monnhein and Langenfeld, Prussia. This was interesting because trolley bus locomotives were used for hauling two or three passenger or freight cars. In addition, the locomotives collected loaded farm wagons along the route to deliver agricultural products to the city.

The modern trolley bus introduced in Salt Lake City in 1928, revived interest in the vehicle in America

In the summer of the same year a charter was sought by the Sayre Trackless Trolley Company which proposed to furnish transportation in the boroughs of South Waverly, Sayre and Athens, in Bradford County, Pa. Granting of the charter was opposed by the attorney general of Pennsylvania, however, on the ground that existing statutes did not cover the operation of such vehicles.

Commenting on one proposed system and the previous experiments that had been made, the Journal in November, 1904, stated that trolley buses held forth real possibilities and regarded the "unseemly merriment which the proposition provokes from the average street railway man," as unjustified. The editorial went on to state that the excessive cost of tires, averaging around 3 cents per mile for light automobiles, and the rough streets and roads, causing uncomfortable rides, excessive maintenance and high consumption of energy, were the two chief obstacles to be overcome. Commenting again in June, 1905, on proposed systems in Nahant and Brookline, Mass., the Journal stated: "The trackless trolley, whatever may be one's judgement as to its commercial merits, is not a thing to be turned down offhand in these days of automobiles. It is an automobile system with a continuous source of energy, being thereby limited in its sphere of action, but relieved of the necessity of carrying a prime mover with it." It further stated that the present rolling stock is at a serious disadvantage, being much more expensive than street cars of similar carrying capacity, and that the tire problem is a specially grave one.

Chicago, with 114 units, now has the largest trolley bus system in the world

During the period from 1905 to 1909, a number of systems were installed on the Continent of Europe, principally in Italy, Germany and Austria. Although there were several types in operation, there were only three fundamental designs. The Mercedes-Stoll system, used in various parts of Austria, operated a 12-passenger, 5,000-lb. vehicle, with a four-wheel over-running trolley carriage, joined to the vehicle with a flexible cable, similar to that used in the early Lombard-Gerin systems. Where only two wires were erected and two vehicles had to pass, the cable connections at the vehicles were switched. The most interesting feature of this vehicle was the building of the motors as a part of either the front or rear wheels. The armatures were wound on the axles, and the fields built right into the wheels. The Filovia system, found in several cities of northern Italy, also used a four-wheel trolley carriage, but instead of being over-running it was pressed against the under side of the wires with a single pole. The vehicles had a seating capacity of 20 passengers, weighed 6,000 lb. and had solid rubber tires on 33½-in. front wheels and 37½-in. back wheels. They were equipped with three water-cooled mechanical brakes, and two 15-hp. motors, mounted on the chassis. Spur gearing and chain drive for the rear wheels were used. The Schiemann system, used mainly in Germany, employed a 15-passenger, 6,280-lb. rubber-tired vehicle, equipped with a single trolley pole which pressed two trolley shoes against the wires. A single motor propelled the vehicle and was geared to the front axle.

On Sept. 11, 1910, the first commercial trolley bus system in the United

States was installed. This was a 1½-mile line of the Laurel Canyon Utilities Company, which extended from the Los Angeles-Pacific railway tracks near Hollywood, up Laurel Canyon to a settlement known as Bungalow Town. Service originally was given with motor buses, but they did not perform satisfactorily over this route, which had a minimum grade of 4.5 per cent, an average grade of 8 per cent and a maximum of 12 per cent. Accordingly, the company removed the engine and transmission from two Oldsmobile buses and substituted two 15-hp. motors, and a chain and sprocket drive. Two wooden trolley poles were used, with aluminum shoes for collection. No turnouts were needed in the overhead, since the vehicle could coast almost the full distance on the downhill trip. The buses used had a seating capacity of 16 and weighed 3,000 lb. This system was operated for several months before it was abandoned.

About this same time England became interested in the trolley bus and made extensive studies of existing systems. As a result both Bradford and Leeds started operation on June 20, 1911. These were the forerunners of several other systems to be opened up in the next and subsequent years. England contributed immeasurably in refining the trolley bus and in a few years assumed the lead in number of vehicles, a position still held.

An interesting variation of the trolley bus, known as the "trolley truck," was developed in New Haven, Conn., in the summer of 1912 by the Trolley Electric Vehicle Company of America. It used a single trolley pole, but had storage batteries for use away from the overhead.

The second commercial trolley bus system in the United States was installed in Merrill, Wis., by the Merrill Railway & Lighting Company, early in 1913. The high cost of building track over three railroad crossings and reconstructing a bridge over a river to support street cars was the principal reason for installing a railless vehicle. The general manager in Merrill had seen an electric bus for a department store in Chicago and requested the Field Electric Bus Company, the manufacturer, to construct a similar vehicle, equipped with a suitable motor and two trolley poles. The vehicle, weighing 6,000 lb., had a seating capacity of 18 passengers, and the single 15-hp. motor drove the rear wheels through a universal shaft, bevel gear, jack shaft, differential gear, sprockets and chains. This vehicle was used for approximately a year, when it was sold to the West End Street Railway of Boston. Since no reports of its use there are available it probably was never placed in commercial service in the East.

In 1921 a wave of keen interest in the trolley bus spread over this country. The history of the period from that date to the first of 1930 was reviewed in detail and supplemented with tables of all existing and abandoned systems in the January, 1930, issue of the JOURNAL, and only a summary will be given here. In 1921, the General Electric Company demonstrated a vehicle of Atlas Truck Company manufacture at Schenectady; this same vehicle was shipped to Virginia where it was tested in both Richmond and Norfolk; Detroit tried two types of vehicles, one with a Brill body and Packard chassis and the other manufactured by the Trackless Transportation Company of New York; Brill developed a vehicle and experimented with it at Philadelphia; the Toronto Transportation Commission placed four vehicles in service and the Staten Island Midland Railway inaugurated two lines, totaling 7 miles, with eight trolley buses manufactured by the Atlas Truck Company.

Comfortable, attractive and speedy trolley buses, like this one in Rockford, now operate in eleven American cities

The following year saw an experimental system with two vehicles installed at Minneapolis; a four-vehicle system over two routes started in Windsor, Ontario; the inauguration of a three-vehicle system in Baltimore, the oldest system now in operation; and the addition of 9 miles of route and fifteen trolley buses in Staten Island. Much activity also took place during 1923. Minneapolis and Toronto abandoned their systems; Windsor suspended service on one of its lines; Petersburg, Va., placed two vehicles in service; and Philadelphia and Rochester started their systems, both of which are still in operation. In 1924 Petersburg added three more trolley buses, and Cohoes started a system with four vehicles. The second line in Windsor and the entire Petersburg system were abandoned in 1926, and in the following year the largest installation made to date, in Staten Island, was abandoned.

This waning of popularity, however, was checked, and a renewed interest shown in this vehicle in 1928, when Salt Lake City inaugurated its extensive system with the modern type of trolley bus. The success of this installation led to an expansion of this fleet in 1929 and the starting of service in New Orleans. Manila had ordered eight vehicles in 1928 and placed them in service in February of the following year. The banner year in the history of the trolley bus was 1930, when Chicago placed 70 vehicles in service and ordered fifteen more, and Knoxville, Detroit, Brooklyn and Rockford all adopted the trolley bus. New Orleans also expanded its system during that year.

Early in the present year Chicago accepted four vehicles which had been on trial and purchased 25 more. The six cities which plan to inaugurate service before Dec. 31 have ordered a total of 47 units. Of these new installations the Kenosha one will be particularly interesting since it will replace completely the street car and motor bus services, and thereby become the first 100 per cent trolley bus system in America. At Shreveport the railway demonstrated a unit previous to a special election at which the vehicle was overwhelmingly approved.

From this outline of the history of the trolley bus it will be seen that it is an old vehicle, but the modifications of design in 1928 and the years following have been so revolutionary that it can now properly be termed a modern unit of transportation. Its success in the many cities where it is being used and the confidence which operators are gaining through observation of its performance in various kinds of service, indicate that in the years to come its operation may be expected to expand at a rapid rate and play a vital part in co-ordinated community transportation.

NEWS *of the Industry*

Improvement Projects

Santa Ana, Cal.—Pacific Electric Railway officials have agreed to build the necessary rail connections at a cost of $40,000 for proposed Pittsburgh Plate Glass factory here.

◆

Washington, D. C.—Work has been started by the Mount Vernon, Alexandria & Washington Railway on relocation and rebuilding of its trackage in District property south of the Highway Bridge.

◆

Minneapolis, Minn.—The Minneapolis Street Railway budget for 1932 to meet the proposed paving plan of the city is $559,275. Of this, $300,000 is for the track department, $125,000 for the power department, and $135,000 for the mechanical department.

Fare Changes

Toledo, Ohio—The Community Traction Company has adopted a 1-cent fare for children of less than eight years of age and under 50 in. high. A marker at the door is used to gage the height. Children of more than eight, regardless of size, can ride for 5 cents, or half fare, if tickets are used.

Bus Operations

Hartford, Conn.—The Connecticut Company, in furtherance of its plan to expand bus service here, has begun the operation of buses on the Broad Street route.

◆

Jamestown, N. Y.—The Jamestown Motor Bus Transportation Company, bus operating subsidiary of the Jamestown Street Railway, has withdrawn its application to the Public Service Commission for permission to operate a bus line between Jamestown and Frewsburg, N. Y.

◆

Jacksonville, Fla.—Colonial Stages has withdrawn its request for a franchise to furnish the city bus transportation to replace street cars of the Jacksonville Traction Company. N. B. Estes, vice-president of the bus company, attributed the withdrawal to the Council committee's slowness in considering the proposition, and inability of his company to get ready to operate the buses by the time the railway franchise expires if his proposition should be accepted.

◆

Brooklyn, N. Y.—The Brooklyn Bus Corporation announced on Sept. 16 that three more bus routes of the twenty routes included in its franchise from the city would be placed in operation before the end of September. The bus company now has ten routes in service.

(*Late News Continued on Page 556*)

Ingenuity and Salesmanship Can Win Car and Bus Riders

"Ours is now a merchandising business as well as a standby ready to serve utility," declared Walter A. Draper, president of the Cincinnati Street Railway, in his message of welcome to the Central Electric Railway Master Mechanics' Association, in convention at Cincinnati on Sept. 9. The message was read in his absence by J. B. Stewart, Jr., general manager. "We must readjust ourselves to a new normal and as part of the readjustment many people must come to realize that the street car and bus must be their regular means of going and coming. To reach and keep this group our ingenuity and salesmanship will be put to the test."

Emphasizing the importance of studies now being made by the Master Mechanics Association, Mr. Draper said:

> There has never been more need for a careful survey of what can and must be done by the local transportation industry than the present. We have been affected by the same things that have caused a slowing up in all industry, and we too should begin to feel the upturn when it comes. It is my opinion that very few lines will see a revival in extent anything like that experienced in 1929, and that a new normal will be established. It therefore becomes necessary for us to adjust ourselves to this new normal, a normal appreciably lower than any to which we have been accustomed.
>
> If this be true, then the need will be great for us to give just the kind of consideration to readjustment that these master mechanics give to their work when they get together. I think we will have to consider not only how we can reduce costs, but also how we can provide a more comfortable, faster, cleaner and quicker ride.
>
> There is a great deal to be said in favor of the convenience and cheapness of our public transportation, but the fellow who has bought himself an automobile and is willing to pay what it costs to ride back and forth prefers to go that way or he wouldn't do it. If he is compelled to give up using his automobile by economic reasons rather than because he finds the street car or bus more convenient, then he is going to miss his own automobile and is going to be inclined to criticise the public service. His own car may have been dirty and noisy and subject to breakdowns and delays, but he is going to excuse none of these things in the street car or the bus. We must, therefore, set up a standard that will not merely satisfy a passenger or will give him no warrant to complain, but a standard that will serve to attract customers and make a regular rider out of a casual one.

As Mr. Draper put it, a large part of the work to be done to make service attractive and serviceable lies in the domain of the master mechanic.

The Business Outlook

BUSINESS passes the middle of September with no signs of seasonal stimulation in any important line. Steel demand and electric power production remain stagnant, with steady slackening in freight movement and money turnover as measured by check payments. Building contracts and coal output alone give faint signs of response to seasonal influences. The continued climb of currency outstanding points to an increasingly acute crisis of confidence intensified by the steady weakening of security markets. The comparative steadiness of commodity averages is encouraging but conceals a still unstable price situation. The European picture likewise is superficially reassuring but the essential issues are still submerged.

—*The Business Week.*

◆

Philadelphia Schedules Liberalized

To stimulate a general increase in business and social activity coincident with the approaching fall season, directors of the Philadelphia Rapid Transit Company authorized the operation of more frequent service on practically all of the company's street car routes, effective on Sept. 14. The new schedules provide an average of 8 per cent additional service for the entire surface system, with increases reaching 20 per cent on a number of lines.

Routes carrying the greatest number of passengers are, as a general rule, receiving the largest increases, although on many other routes where riding is comparatively light and where it is felt more riding can be encouraged, substantial additions to service are being effected.

Under the new schedules, daily car-miles will total 172,148 as against the former figure of 159,636. The increase in daily round trips operated will be 1,101.

Service on Broad Street Subway and Market-Frankford Subway-Elevated is also being adjusted upward.

◆

Revenue Passenger Statistics Constant

The tabulation of railway and bus traffic for August, 1931, compared with August, 1930, as reported to the American Electric Railway Association by 111 companies is as follows:

August, 1931	363,805,552
August, 1930	404,745,536
Decrease	10.12 per cent

Adding the revenue passengers carried by the companies from which reports were received too late to be included in the totals given as of Aug. 12 218 companies reported for July as follows:

July, 1931	731,987,200
July, 1930	800,425,603
Decrease	8.55 per cent

Bus Operations

(*Continued from Page 555*)

St. Louis, Mo.—The Public Service Commission on Sept. 9 took the testimony of four companies that seek permission to operate bus service on Federal Highway No. 40 (the St. Charles Rock Road) between Edmonson Avenue, St. Louis County, and St. Charles, Mo. On this stretch of 7 miles, the St. Louis Public Service Company has asked to be allowed to discontinue railway service, but at the hearing some weeks ago on this application, none of the bus companies offered bus service as an alternative.

◆

Boston, Mass.—The City Council has denied the Eastern Massachusetts Street Railway permits to operate bus lines between Dedham-Boston line and Forest Hills terminal and between Pierce Square, Dorchester, and Ashmont terminal of Boston Elevated.

◆

St. Louis, Mo.—On Sept. 1 jitneys operating on the Delmar, Page-Wellston and South Grand Boulevard routes here commenced operating on a ten-minute schedule until 1 a.m. The lines compete with cars of the St. Louis Public Service Company and buses of the People's Motor Bus Company. For the late service a 25-cent fare is charged compared with 10 cents on street cars and buses. The service car organization is also operating seven cars on its South Broadway line at 1 a.m. at the same fare but at irregular intervals. Most of the cars seat seven persons in addition to the driver.

Service Changes

Los Angeles, Cal.—As a trial plan for improving Pacific Electric Railway service to Hollywood, the Board of Public Utilities and Transportation has approved the request of the company for a rerouting of its lines, application for which is pending before the California Railroad Commission. The board's engineers report that there is no basis for the contention that the Hollywood surface lines as a whole are inadequate.

◆

Chicago, Ill.—Opposition to the proposal of the Chicago Surface lines to institute one-man service in some sections of the city has caused the Illinois Commerce Commission to delay a decision in the case until the opposition has more time to air its views. E. J. McIlraith, Surface Lines engineer, said the one-man cars would be placed in operation only on night and Sunday shifts on lines where the service did not exceed the seating capacity of the cars, and in the daytime on lines where the passenger traffic is light.

Financial News

Butler, Pa.—The tangible property of the Pittsburgh, Harmony, Butler & New Castle Railway and the Pittsburgh, Mars & Butler Railway, which includes 120 miles of trackage, poles, overhead trolley wires, 34 passenger cars, 60 freight cars, 26 bridges, power stations and other equipment, will be sold on Oct. 7 in Pittsburgh by Maurice R. Scharff, the receiver.

◆

New York, N. Y.—The Transit Commission has denied the application of the Third Avenue Railway for a rehearing on its petition for permission to issue $240,000 in notes for the purchase of buses for subsidiary companies operating outside the metropolitan district.

◆

Olean, N. Y.—Alvin R. Bush, president and general manager of the Allegany Motor Coach Company, operating buses in southern and western New York and northwestern Pennsylvania, has been named receiver of the Erie County Traction Company, serving Hamburg, Orchard Park and Gardenville by trolley. The receiver plans to substitute bus for rail service.

◆

New York, N. Y.—Chairman Fullen, of the State Transit Commission, and others interested in promoting unification have compared the percentage drop in subway travel with the percentages of average recession in general industry and find the railroad losses are minor in comparison to those suffered by other business.

◆

St. Louis, Mo.—Chairman Waddill of the State Tax Commission has submitted the final recommendations of the commission to the State Board of Equalization, which fixes the final assessments. The commission's report covered the property of 53 railroads, fourteen street and electric interurban lines, 21 bridge companies, five telegraph companies, 190 telephone companies, 49 electric light and power companies and four oil pipe line companies. Street and electric railways values were fixed at $57,624,507, a decrease of $2,740,485. The Tax Commission fixed the assessment of the St. Louis Public Service Company at $40,001,026 compared with $44,452,395 last year, recognizing the ruling of the Circuit Court to adjust some of the phases of last year's assessment.

Commission Commends Milwaukee Merchandising

During the past two years, but more particularly within the past six months, the Milwaukee Electric Railway & Light Company has been making a determined, and apparently a successful, effort by managerial ingenuity and resourcefulness to promote street and electric railway riding, and thus win back a part of the market lost to the motor vehicle. On the Milwaukee system riding has been maintained on a comparatively constant level, and in spite of an unprecedented industrial depression there has been a tendency toward increased riding until the last two or three months, when unemployment has apparently increased markedly. In a business with a constantly expanding market it does not require exceptional managerial ability to furnish good service and earn a return. To produce such results in the face of a constantly declining market is a genuine accomplishment.—*Public Service Commission of Wisconsin.*

Regulation and Legal

Annapolis, Md.—The Anne Arundel County Taxpayers League at a meeting here discussed having the court act on a ruling handed down by the Attorney-General, which held that there could be no referendum on the law passed by the last session of the Maryland General Assembly exempting the Washington, Baltimore & Annapolis Electric Railroad from the payment of taxes for the next two years. The Attorney-General held that the petition filed with the State asking for the referendum lacked the necessary number of signers, 10,000.

◆

New York, N. Y.—*The American City* for September quotes from the article on the violation of parking restrictions contributed to Electric Railway Journal for August, by John A. Miller, Jr. Paragraphs from the original presentation are quoted which *The American City* thought particularly pertinent for presentation to its readers.

◆

Chicago, Ill.—Corporation Counsel William H. Sexton reopened the city's fight with the elevated lines for restoration of three-for-a-quarter fares on Sept. 14, when he mailed to the United States Supreme Court the city's brief appealing from the adverse decision of the United States District Court here. Oral arguments are expected to be made before the Supreme Court in October. The case has been kept alive since the District Court in September, 1930, issued a permanent injunction restraining the Illinois Commerce Commission from interfering with the increased rate, 10 cents straight fare.

General

Seattle, Wash.—Appointment of the Municipal Railway Commission of five citizens by Mayor Harlin has been confirmed by Council. After an organization meeting to choose its own chairman, and determine the initial terms of its members, to range from one year to five years, the commission will start upon the task of choosing an expert manager for the Municipal railway system, and laying out a program for operation.

◆

Richmond, Cal.—According to Richmond United, published by the local chamber of commerce, students of public affairs are wondering whether the next step may be a proposal for the East Bay Municipal Utility District to take over the transportation system now run by the East Bay Street Railways for the same cities now served with water, plus the city of Hayward. This could be done under the existing State law, provided it was favored by the people.

(*Continued on Page 558*)

Service Changes in Spokane

Buses were placed in service on Sept. 9 on the Cable Addition line of the Spokane United Railways upon the arrival of four new 28-passenger Fageol buses. The Cable Addition buses make a downtown loop. The city is now engaged in preparing to pave South Bernard Street, which is on the bus route. Consequent upon the adoption of buses for the Manito and Cable Addition lines, the Hillyard and Broadway lines have been linked, cars proceeding through the downtown district on Riverside Avenue. The Lidgerwood line will make a loop in the downtown district. The East Sprague and Weest Cleveland lines have been linked. The routes of the Manito and Cable Addition lines have been so rearranged that cars make only one left turn in the business district.

A Plea for Settlement in St. Louis

The city of St. Louis, Mo., must act at once to solve its intricate transportation problems. So Stanley Clarke, president of the St. Louis Public Service Company, declared in an open letter sent to business men of the city in part as follows:

> At the conclusion of our wage arbitration hearing, I stated that this company has been forced to cut its executive personnel to the point of bare operating necessity.
>
> It is true that the present condition of abnormally low earnings is due to the depression, but unless we observe the most rigid economies, it will be impossible for us to continue to provide public transportation service.
>
> These economies mean an abandonment of all our engineering and traffic studies and other research work. During the past several years we have spent many thousands of dollars in analyzing the transportation needs of St. Louis, and in seeking to arouse business men and the public generally to an appreciation of the necessity for immediate action in securing a transportation settlement. That money and that effort will have been wasted and St. Louis will have slipped back years in its civic development, unless there is decisive action in securing a transportation settlement.
>
> Conditions surrounding public transportation service are not static. Operating methods change. Financial conditions change. The attitude of the public changes. The painstaking studies and well-considered recommendations by the city's transportation survey commission are in some respects inapplicable today.
>
> So, if any benefits are to be garnered from the money and the labor that have gone into the research and planning carried on by this company and by other bodies and individuals in recent years, we must act at once. A year from now will be too late.
>
> Nothing collects dust on the top shelf in the closet so effectively as a transportation analysis or report or recommendation. Let's keep transportation off the shelf.

Buffalo Men Praised

One thousand employees of the International Railway, Buffalo, and members of their families thronged the Statler ballroom on Sept. 11 in a victory convention celebrating the success of their fifth annual picnic and the achievement of a new record in safety performance. B. J. Yungbluth, president of the railway, presented to the men of Broadway station a set of engrossed resolutions recognizing their achievement in excelling all other departments in the value of tickets sold for the picnic. President Yungbluth also awarded a magnificent silver safety trophy to the men at Hertel station, champions in safety performance for August. The trophy will be held by Hertel station until its current safety performance is bettered by another station. The district making the best showing for the year will receive the trophy for permanent possession. Mr. Yungbluth paid special tribute to 27 men of that division who have operated their cars for one year or more without a single chargeable accident.

Remission of Baltimore's Park Tax Sought

Lucius S. Storrs, president of the United Railways & Electric Company, Baltimore, Md., has sent a letter to Mayor Jackson in which he points out the injustice of requiring the public or the company to pay the park tax while the thousands of motorists who make use of the parks pay nothing. Mr. Storrs says that justice to the car rider and railway requires the elimination of the tax, and the assumption of the burden of maintaining the parks by the taxpayers.

Mr. Storrs also suggests to the Mayor that, should it be found inexpedient to eliminate the tax completely, it may be possible to work out a plan under which there will be a gradual reduction in the park tax over a period of years. He indicates that if the city cannot now grant substantial relief, the advisability be considered of making the park tax collectible after the payment of the United's fixed obligations, but before any dividends are authorized on the company's common stock. During the time the tax has been in force, the United and its predecessor have paid the city more than $28,000,000.

The move for the elimination of the park tax by the United was made possible through action of the Maryland General Assembly at its session in 1929. At that time, authority to reduce or eliminate the tax was given to the city by a bill which was passed and signed.

Some of the members of the City Council have expressed their views one way or the other, but Mayor Jackson has made no public announcement. The tax amounts to about 9 per cent of the company's gross revenue, and the payments under it since 1919 have bulked to more than $1,000,000 a year.

New York Seeks Bids on Cars

Inquiry has been made by the Board of Transportation of the City of New York, calling for bids on 300, 500, 1,000 and 1,500 subway cars. Each car probably will cost between $30,000 and $40,000 fully equipped, depending upon the amount of special work required. On this basis, the award will involve from $9,000,000 to $60,000,000. Bids will be submitted on Oct. 25 and the award probably will be made soon afterward, calling for either of the four amounts involved, depending upon the advantage in price offered.

New Interurban Entrance Plan Under Negotiation

Negotiations have been opened between the Louisville Railway and the Interstate Public Service Company, which will probably result in the Louisville Railway operating the interstate interurban line between Louisville and New Albany, Ind. A contract between the Interstate and the Kentucky & Indiana Terminal Railroad, regarding trackage rights on the New Albany bridge; and also with the Louisville Railway, for use of its trackage from the bridge, 4 miles downtown, to the heart of the city, expires on Oct. 4. The local company also supplies power used by Interstate within Louisville. There is a differential between the two companies on local fares, but in the event the Louisville Railway took over the service, New Albany cars instead of coming uptown would probably carry passengers to a transfer point near the bridge, where they would take the local cars, thus reducing traffic congestion by doing away with interurban cars making the 5-mile haul, mostly within Louisville's congested district. The Interstate company took over the operation of the line from the Louisville & Northern Railway & Light Company on Oct. 5, 1906, for a period of 25 years.

Richmond Men About to Brush Up on History

Street car and bus operators of the Virginia Electric & Power Company going out on a sightseeing trip to become better acquainted with historic and other places of interest in Richmond in preparation for the large tourist trade that Richmond and Yorktown are looking forward to materialize during the sesqui-centennial celebration of the surrender of Lord Cornwallis on Oct. 19, 20 and 21.

Special Train Service From New York City

The Pennsylvania Railroad and the Central Railroad of New Jersey are providing special accommodations between New York and Atlantic City for the convenience of those attending the convention. These arrangements are for two different days.

The Central Railroad of New Jersey will provide special cars on the "Blue Comet" on Saturday afternoon, Sept. 26. The schedule follows:

	Daylight-Saving Time
Leave West 23rd Street, N.Y.C.	3:17 p.m.
Leave Liberty Street, N.Y.C.	3:30 p.m.
Leave Jersey City	3:42 p.m.
Leave Broad Street, Newark	3:40 p.m.
Arrive—Atlantic City	6:30 p.m.

Reservations for this and other Jersey Central trains can be made through the office of G. D. Ginder, general Eastern passenger agent, 143 Liberty Street, New York City. Phone Barclay 7-9700. Reservations can also be made through any of the city ticket offices.

The Pennsylvania Railroad will have special cars for the convention delegates on its train No. 1077 on Sunday afternoon, Sept. 27. The schedule is as follows:

	Eastern Standard Time
Leave Pennsylvania Station—33rd Street, N.Y.C.	3:25 p.m.
Leave Hudson Terminal, N.Y.C.	*3:15 p.m.
Leave Manhattan Transfer	*3:37 p.m.
Leave Market Street, Newark	*3:40 p.m.
Arrives—Atlantic City	6:25 p.m.

*(Approximate time).

V. E. Woodward, passenger representative, Pennsylvania Railroad, 390 Seventh Avenue, New York (phone Pennsylvania 6-6000, extension 613) will be very glad to make reservations on this or other trains on the Pennsylvania. Reservations can also be made through any of the city ticket offices.

The one-way railroad fare from New York to Atlantic City is $4.93, and the special round-trip fare to holders of convention certificates is $7.40.

All delegates from New York and vicinity are urged to avail themselves of one or the other of these specials.

◆

Operator Sought for New York's New Subway

New York City's Board of Transportation expects to submit for approval at the first fall meeting of the Board of Estimate on Sept. 25 a form of contract for independent operation of the new Eighth Avenue subway and subsequently completed links of the city's new rapid transit system. With the contract draft, the board will submit a recommendation that proposals be invited from all operating concerns or management corporations that care to tender bids.

The operating contract will provide for its own termination, in the event of consummation of the negotiations with the B.-M. T. and Interborough for unification of their rapid transit lines with the city's network.

The proposed operating contract will have no provision for preferential payments, because no party except the city will have any investment in the new lines. It will provide for either a fixed operating fee or one based upon a lump sum and a percentage of gross revenues. Under it the Board of Transportation, as agent for the city, will have broad powers of supervision and audit.

Members of the Board of Transportation declare that they have not abandoned hope for eventual unification of all rapid transit lines, but conceded that no such plan could be put into effect by Jan. 1, 1932, when it is hoped to have the Eighth Avenue line in operation.

Coming Meetings

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Oct. 12-19—Annual Safety Congress Including Special Electric Railway Section, Chicago, Ill.

Oct. 29-30—Annual Transportation Meeting of Society of Automotive Engineers, Washington, D. C.

Nov. 19-20—Middle Atlantic States Equipment Men's Association, York, Pa.

Jan. 27-29, 1932—Electric Railway Association of Equipment Men, Southern Properties, Richmond, Va.

◆

Reverberations of the Baltimore Case

In a review of orders made by it during the year ended June 30, 1930, the California Railroad Commission says that in only a single instance, namely that of the rate reduction of $300,000 for the Southern Sierras Power Company, was the commission forced to rescind its action. In that case the commission fixed the operating expense of depreciation on the basis of the cost of the depreciable physical property. Subsequently, the United States Supreme Court, in the United Railways & Electric Company, Baltimore, case, held that the operating expense of depreciation, allowed to a utility in the fixing of rates, should be computed on the basis of the present fair value of the depreciable property, and not on the basis of the cost of said property. In the light of this decision, the first of its kind, the commission says it had no alternative but to vacate its decision and to reopen the proceeding for reconsideration in conformity with the Supreme Court ruling.

◆

Replacing Chicago "El" Pillars

Commissioner of Public Works, A. A. Sprague, of Chicago, recently asked Corporation Counsel William H. Sexton whether the Chicago Rapid Transit Company pillars, left standing in the streets when the curbs were moved back, could be declared menaces to safety; whether the "El" can be made to move the pillars back to the new curbs; and whether the "El" can be made to pay the cost of removal. The questions were brought up by an agreement for the removal of posts on Ashland Avenue, just south of Irving Park Boulevard.

To the first question the corporation counsel replied that the pillars, left standing when curbs are moved back, are menaces to safety; to the second question, he replied that the Illinois Commerce Commission now claims jurisdiction; to the third question, his answer was that a mandamus suit might be brought to induce the commission to act and determine who shall pay.

General

(Continued from Page 556)

Warren, Pa.—Traces of trolley operation here and in surrounding communities have vanished with the removal of the rails of the Warren Street Railway from the streets. The railway ceased operation on its city lines a year ago. Overhead equipment was removed immediately, but the last of the rails were taken up only recently. The Warren & Jamestown Street Railway, which discontinued operation of its 21-mile line between Warren, Pa., and Jamestown, N. Y., nearly two years ago, has completed the work of removing its trackage and overhead equipment. The Warren Street Railway has also scrapped its 14-mile line between Warren and Sheffield, Pa.

◆

Havana, Cuba — Service over the Havana Electric Railway was scheduled to be resumed on Sept. 15 after an interruption of 45 days caused by a dispute over wages. Strikers agreed to accept a wage of 26 cents an hour, a compromise on the 24 cents offered by the company, and the 28 cents demanded by the strikers.

◆

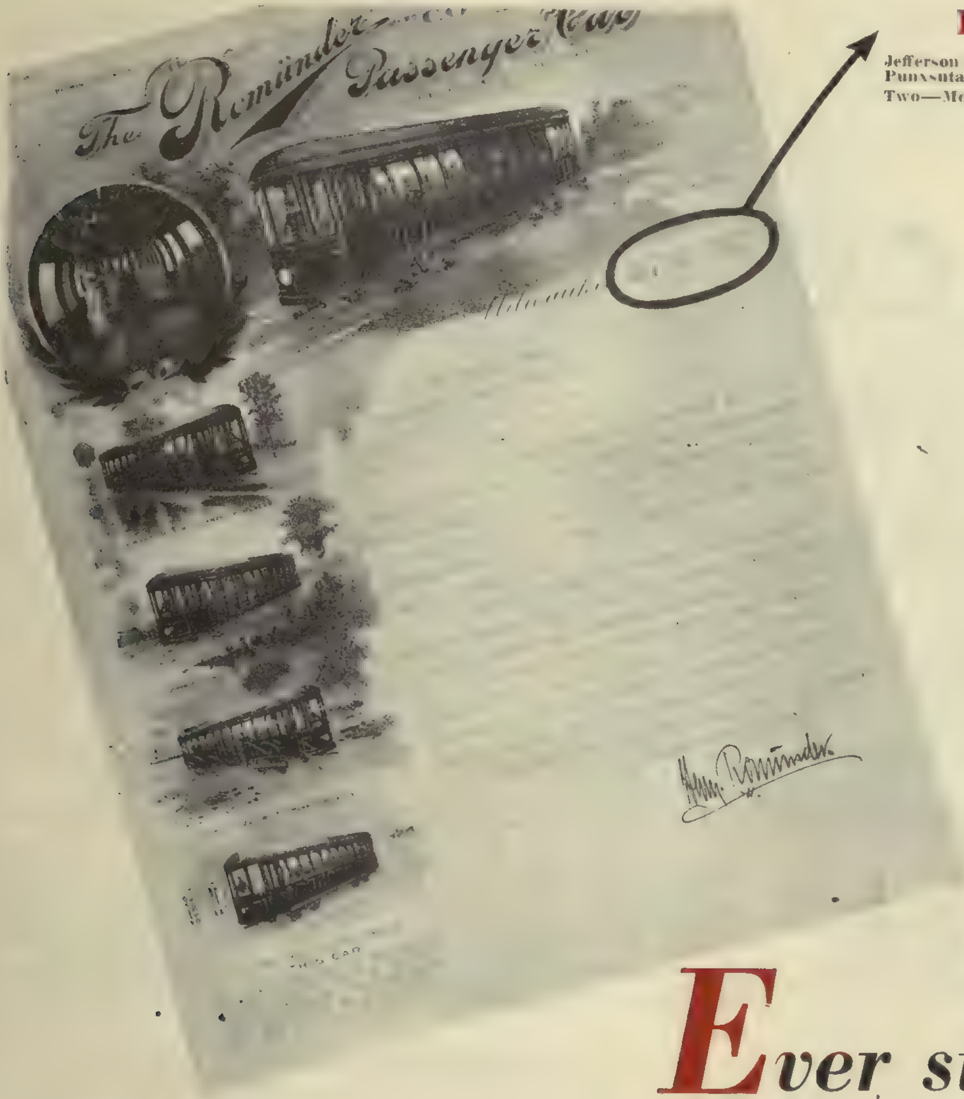
Washington, D. C. — J. H. Hanna, president of the Capital Traction Company and of the American Electric Railway Association, contributed recently to *Bus and Coach*, published in London, England, a 2,000-word discussion headed "Mass vs. Individual Transportation." Among topics upon which he touches are the growth of the use of the private car, traffic congestion, the pirate taxi and the studies being made under A.E.R.A. auspices of the problems of fares and of the design of a modern electric railway car purchasable at a comparatively reasonable cost. The points he made should redound greatly to the benefit of the English and Continental readers of that publication interested in keeping abreast of the mass transportation scene in the United States.

◆

Wichita, Kan.—Motormen, bus drivers, and others employed by the Wichita Transportation Company, have been notified that a wage cut is imminent. Unofficially the cut is said to be 10 per cent.

◆

Michigan City, Ind.—As a further step in the railroad's campaign to eliminate crossing accidents, the traffic lights at Tenth Street and Willard Avenue here have been co-ordinated with the movement of trains of the Chicago, South Shore & South Bend Railroad by a device of the familiar three-color type, which operates at regular intervals for the guidance of automobile and street car traffic. A somewhat similar installation was two years ago by the South Shore Line at Chicago Avenue here.



The Reminder Passenger Car

1904

Jefferson Traction Co.,
Punxsutawney, Pa.
Two—Model A Brakes

1905

Schenectady Railways
Co., Schenectady, N. Y.
Model C Brake

1906

Pueblo Suburban Railway Co., Pueblo, Col.

1907

Colorado Springs & Interurban
Co., Colorado Springs, Col.
E-Type-Brake

1908

Hot Springs Street Railway, Hot Springs, Ark.
Ackney Adjustable Model

1909

Rhode Island Company.
Providence, R. I.
Improved Peacock Model

Ever since those early days—operators everywhere have absolute faith in the rapid, powerful, **SAFE** *action of*

PEACOCK STAFFLESS BRAKES

National Brake Company

890 Ellicott Square, Buffalo, N. Y.
Canada:—Lyman Tube & Supply Co., Ltd., Montreal
The Ellcon Co., General Sales Representative, 50 Church Street, New York City

TEXACO LUBRICATES THESE CHICAGO BUSES

▪ Texaco Lubricants are making excellent performance records on the modern trolley buses of the Chicago Surface Lines. They have proved their effectiveness in lowering maintenance costs under particularly severe operating conditions.

There are 114 trolley buses now in service. Original service started with 29. All of these buses run upward of 3600 miles per month each. Texaco Lubricants, including Texaco Marfak Grease and Texaco 569 Gear Oil W are used.

This is another fine example of the many notable systems throughout the country which are today Texaco lubricated. There is a Texaco Lubricant for every purpose. Write The Texas Company. Ask about Texaco Lubricants and Texaco Engineering Service.

THE TEXAS COMPANY, 135 East 42nd Street, New York City

TEXACO
REG. U.S. PAT. OFF.

TEXACO LUBRICANTS

SINCE 1924 357 MILLION MILES IN TRAFFIC

more than 1½ BILLION passengers

Such figures stagger the imagination. The first is equal to *14,280 times around the world!* The second is only a little short *of the total population of the earth!* Yet these impressive totals are actual miles traveled and passengers carried in the past seven years by the largest motor coach operation in the United States — in that period over 90% on Goodyears!

That operation is the Public Service Coordinated Transport with its subsidiary the Public Service Interstate Transportation Company — jointly operated from Newark, N. J. 2,436 coaches are employed in the service. The territory covered in New Jersey, New York, and Pennsylvania, is the most heavily congested district *as to traffic* on earth. More brake applications are required here on more station and traffic stops than in any other service. There have been minimum road failures on Goodyears. *Over an extended period of years, on an overall test including thousands of coach units, on every point of stamina, traction, cushioning, and public safety there has been maximum satisfaction with the Goodyear Tire.*

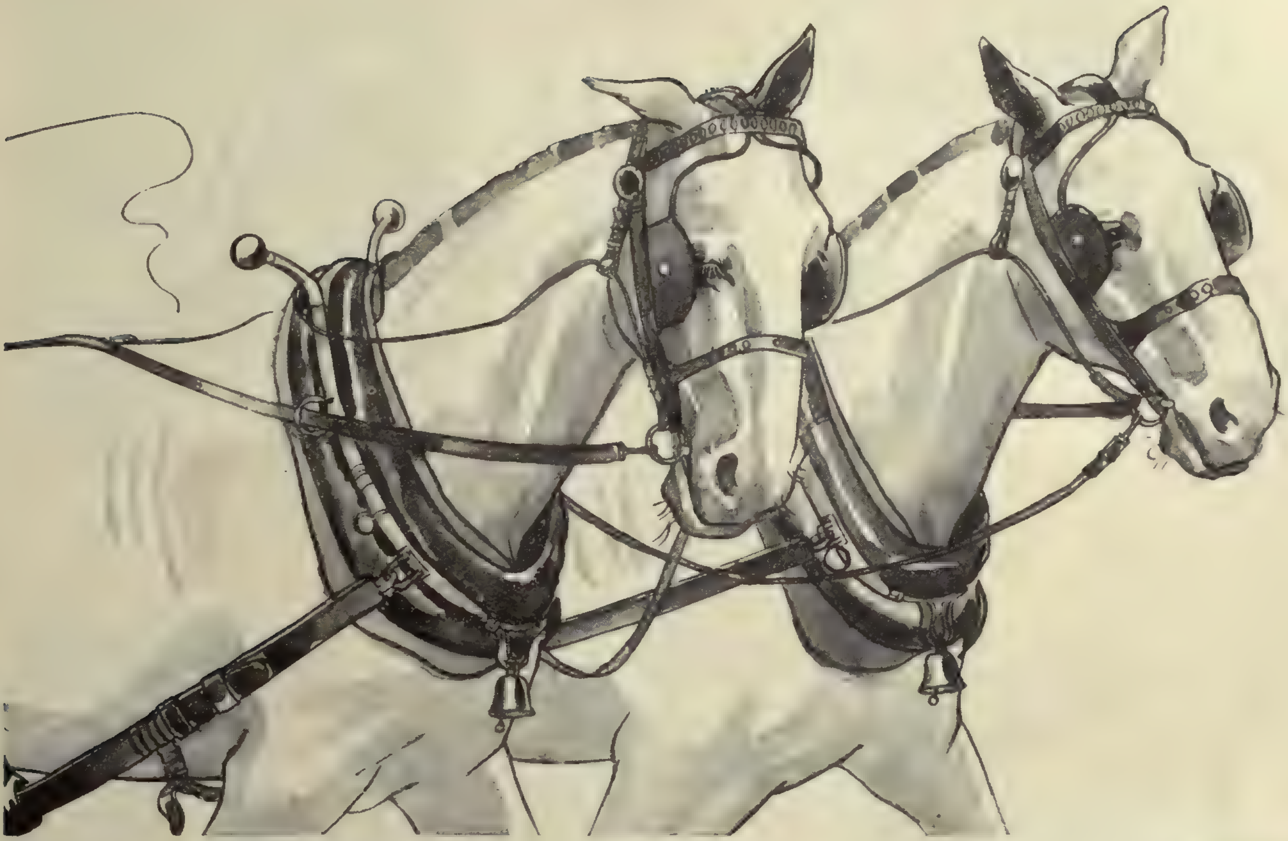
It is a straight-shooting fact, and for good reason, that "more people ride on Goodyear Tires than on any other kind." Both for motor coaches and passenger cars it is *the leading make of tire.* On all your coaches you can have this quality — specify Goodyears.

GOODYEAR

THE GREATEST NAME IN RUBBER

D T A Co

Space C314—at Atlantic
City—Sept. 26 to Oct. 2



I D D A P

FROM two-horse power to 200 horsepower perhaps expresses aptly the immense 50-year strides of electric railway transportation.

Yet the ancient horse-car, for all its delicate soporific odors and its stimulating variety of temperatures, had something that today's public *wants* in its transportation—

QUIET . . . SMOOTHNESS . . . LIGHT WEIGHT. These were and *are* first principles; and traction engineering is sensibly getting back to them.

Timken Worm Drive is a step in the right direction. It eliminates the noise of power transmission, and lops off thousands of pounds of weight with consequent improvement in performance characteristics.

Timken Worm Drive needs no test, no argument. For any vehicle—trolley car, trolley bus, gasoline coach—it's right.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICHIGAN

AERA
50th
ANNUAL CONVENTION
·ATLANTIC CITY·
·NEW JERSEY·
·SEPT·26·
·OCT·2·
1931

UNSEEN behind the noisy surge and sly retreat of the surf, silently the tide is moving. Storm winds may hold it back now and anon, but in time, the inlets, the harbors and the river mouths are full again and the laden ships come home to port.

Barron G. Collier
INCORPORATED
NEW YORK CITY

Fire COMPLETE

Cuts Bus Operating

FIRESTONE BUS BALLOONS—provide extra values found in no other tire: 1. Gum-Dipped Cords which minimize internal friction heat and add 58% to the flexing of Firestone Cords. 2. Two extra protective plies under the Tread—26% greater protection against punctures and blowouts. 3. Tougher, wider, deeper-grooved tread—25% to 40% longer tire life and quicker trips through increased speed with safety which assures on-time schedules without delay.

Firestone Tubes

are circular molded to perfectly fit the shape of the tire—no pinching or buckling. Firestone Tubes are built to give extra service under hardest usage.

TIRES • TUBES • BRAKE LINING

Copyright, 1931, The Firestone Tire & Rubber Co.

stone

SERVICE

Costs to the Minimum

Firestone New Type Bus Battery

with patented removable terminals and handles, and genuine one-piece hard rubber case, gives you extra power at lowest cost per mile.

Firestone Spark Plugs

eliminate compression and power losses, produce maximum spark. Firestone Spark Plugs are built to S. A. E. precision specifications.

Firestone Bus Blocks

meet every requirement for heavy duty braking with a minimum of wear on equipment.

It will pay you well to investigate this *complete* Firestone service—developed through years of close contact and daily experience with the bus industry. Your local Firestone dealer will gladly show you how it starts saving money for you *at once*. See him today and get the benefit of tested equipment and skilled service in cutting operating costs to bed rock! When purchasing new equipment insist on Firestone Balloons, Firestone Tubes, Firestone Rims, Firestone Batteries, Firestone Spark Plugs and Firestone Brake Lining.

Listen to the Voice of Firestone Every Monday Night over N. B. C. Nationwide Network

BATTERIES • RIMS • ACCESSORIES

OSGOOD-BRADLEY

A 42-seat vehicle built to electric railway standards

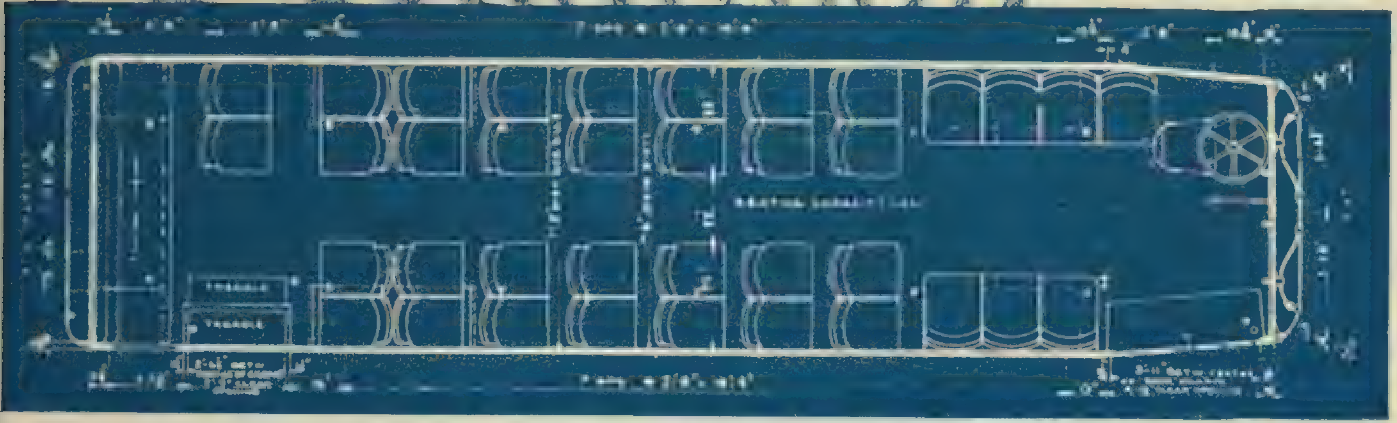
We should like to send you a complete specification describing the new features in detail. We think you will like this big trolley bus with its familiar standard railway equipment and with its rugged construction based on railway car principles of design.

You will be surprised by its roomy interior, with 42 comfortable passenger seats, wide aisle and plenty of room for entrance and exit.

You will be impressed with several Osgood-Bradley features—entirely new. For instance, the unusual and absolutely effective insulation from electric shocks to passengers boarding or leaving and the complete installation of control wiring on the interior above the level of the floor. Noiseproof rubber-mounted trolley board to prevent "rumble." Back-to-back seats over wheel-housings.

Let us demonstrate these, and other features, which make this new Osgood-Bradley Trolley bus a practical operating proposition for any electric railway company.

TROLLEY BUS:



OSGOOD-BRADLEY CAR CORPORATION
WORCESTER » MASS.

Here is Progress in Passenger Comfort!

Sales Offices

Heywood-Wakefield
174 Portland St.,
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Bldg., Chicago, Ill.

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Houston, Texas

J. R. Hayward
Liberty Trust Bldg.
Roanoke, Va.

H. G. Cook
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San Francisco, Calif.

A. W. Arlin
Delta Bldg.
Los Angeles, Calif.

Ry. & Pwr. Eng. Corp.
Montreal, Toronto,
Winnipeg,
Vancouver, Canada

FOR 50 years and more Heywood-Wakefield has been identified with the great industry of transportation. It has manufactured seats for the plodding horse car and the fleet winged passenger planes of today. Year after year, it has experimented, developed, and created new ideas in passenger comfort.

Competition in the transportation field has necessarily placed emphasis on passenger comfort. Seats are no longer incidental equipment, but a recognized factor in getting and holding patronage.

Whether your requirements call for luxurious comfort; space saving; serviceability; or any combination of these qualities, you'll find a seat that fits the need in the Heywood-Wakefield line.

See Them at Atlantic City An interesting exhibit of the latest ideas in Electric Railway Seating will be shown in our space (E 506 and E 508) at the Atlantic City Convention. Representatives will be on hand to discuss your requirements and to demonstrate any seat in detail.

HEYWOOD—WAKEFIELD

TRANSPORTATION SEATING

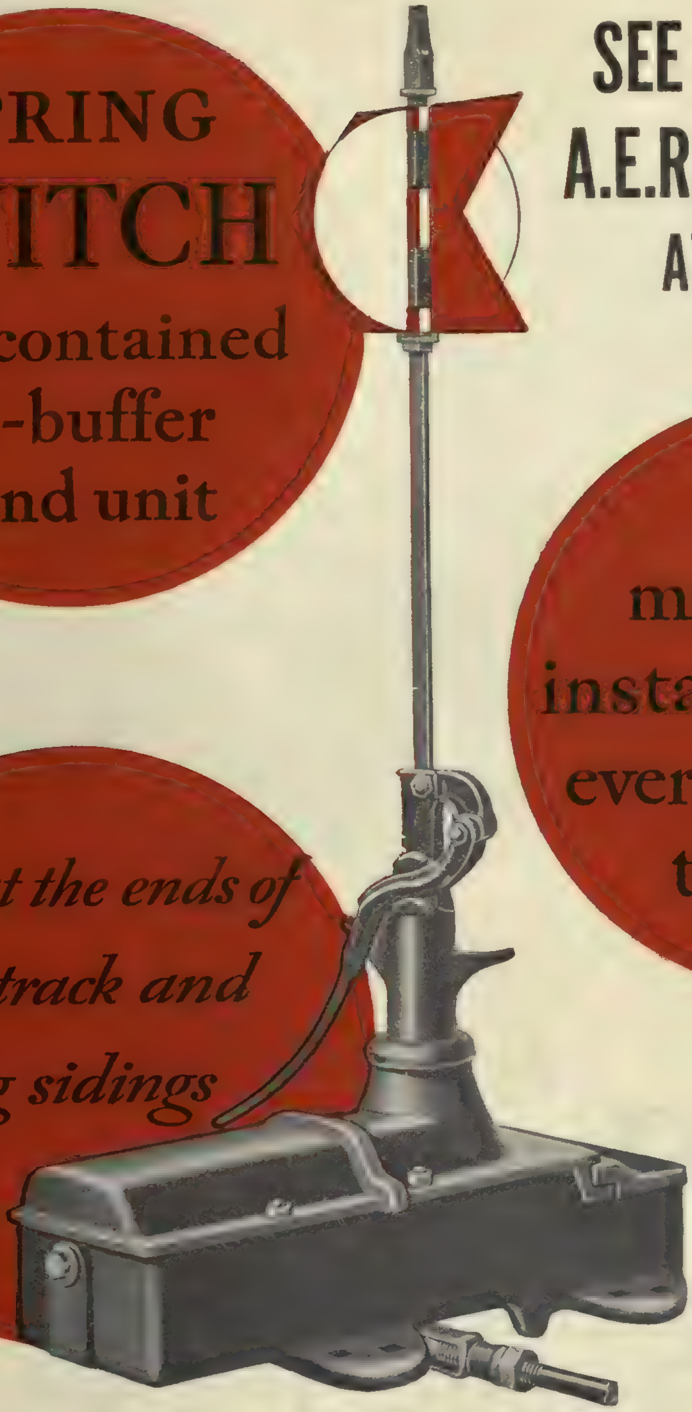
SPRING SWITCH

self-contained
oil-buffer
stand unit

SEE OUR EXHIBIT
A.E.R.A. SPACE E-515
ATLANTIC CITY

Saves
more than
installation cost
every month of
the year

used at the ends of double track and passing sidings



3-IN-1 SWITCH STAND
STYLE NO. 100-A

After severe tests at such locations, many of the leading roads have now adopted the 3-in-1 switch stand as standard. None of the claims we have made for this stand were disproved during these tests. The 3-in-1 was especially designed for use at the ends of double track and passing siding. Its three features, all combined in one compact housing, are:

1. The switch stand spindle is connected rigidly with the switch points, assuring positive target indication for position of switch points and rigid throw for hand operation.
2. Two automatic double-coil springs returning points after trailing train has passed.
3. A retarding oil-buffer preventing return of switch points between successive pairs of wheels.

This is the first switch stand to combine all these features in one compact housing; in hand throwing it *cannot* be closed and locked when an object intervenes between the points and the stock rail.

Many locations on your road need this switch stand. Write today for complete printed information about the 3-in-1.

. . .

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
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General Offices—230 Park Avenue, New York

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RACOR

1905
From 4 wheel days 'till now
1931
Erico

RAIL BONDS HAVE HELPED TO MAKE THE CHANGE

Back in the days of the four wheel open cars, there appeared in Street Railway Journal for November 24, 1906, "The Electric Railway Improvement Co. is successfully introducing its method of welding rail bonds by current."—At that time development and early use of brazed bonds had preceded this announcement by three years.

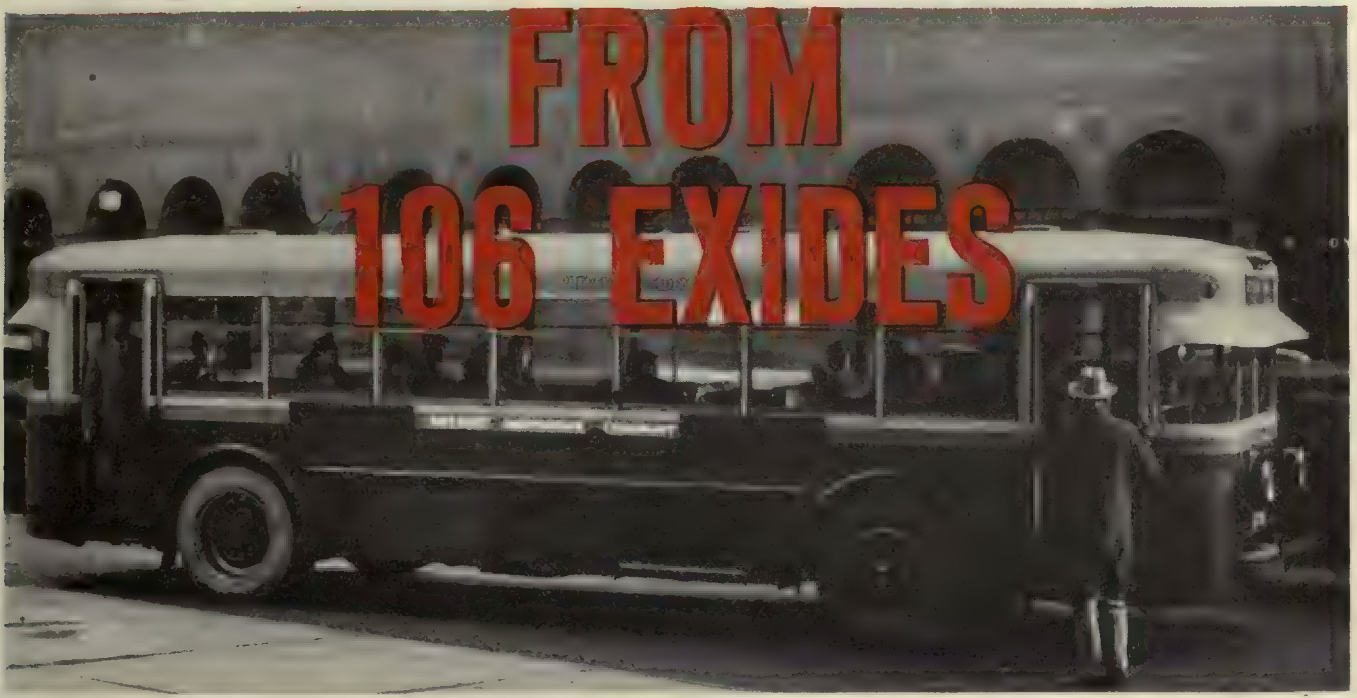
As each succeeding year saw greater speeds, heavier cars and larger rails, the increasing important subject of rail bonding was met by improvements in Erico brazed bonds.

Today's problems in bonding recognize the sound engineering principles of welded bond efficiency pioneered by Erico 25 years ago. Erico now offers a complete line of welded bonds backed by the knowledge gained in our long experience with welded bonds. Call on us at any time or let us get together at Atlantic City—booth No. E-610.

THE ELECTRIC RAILWAY IMPROVEMENT CO.

2070 East 61st Place, Cleveland, Ohio.

12,084,000 MILES FROM 106 EXIDES



...and not one plate or separator renewal... proper maintenance played important part

"Exide Batteries have given us excellent service. Suggestions and advice on proper maintenance by Exide field engineers have helped materially to reduce our battery costs per bus mile"—Detroit Motor Bus Company.
Let us show you how to get lowest cost per bus mile.

Exide
MOTOR COACH
BATTERIES

The battery that gives you lowest cost per bus mile. Exide—long-lived, dependable, saving.

These 106 Exide Batteries (Type KXK) in the service of the Detroit Motor Bus Company averaged 114,000 miles each and gave an average life of 32 months each. The total battery repair cost of this company's entire fleet of 393 buses averages but $271.10 per year, for a period of three years. These buses cover over 12,000,000 miles annually in *urban* service. With Exide users having experience like this, is it any wonder we say, "Exides give lowest cost per bus mile."

It's the built-in dependability and uniform rugged construction of Exides, plus proper maintenance, that make these batteries cost least per mile. There are no weak spots in an Exide . . . rebuilding is not necessary. This battery is in your bus till it wears out. Gives you reliable performance all the way, at a saving.

EXIDES GIVE LOWEST COST PER BUS MILE

Of course you want to keep maintenance figures down. The question is, "How?" That's what we're here for, to show you how to get lowest cost per bus mile. Don't hesitate to make your problems ours. We want to serve you as well as sell batteries—to show you that Exides cost the least in the long run. Write today for facts. No obligation. We helped the Detroit Motor Bus Company. We can help you.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto

The public utility system of

Standard Gas and Electric Company

includes

● Pittsburgh Railways Company
● Market St. Railway Company (San Francisco)
● Fort Smith Traction Company
● Southern Colorado Power Company
● Northern States Power Company
● Wisconsin Public Service Corporation
● Wisconsin Valley Electric Company
The California Oregon Power Company
Duquesne Light Company (Pittsburgh)
Equitable Gas Company (Pittsburgh)
Kentucky West Virginia Gas Company
Louisville Gas and Electric Company
Mountain States Power Company
Oklahoma Gas and Electric Company
Philadelphia Company
San Diego Cons. Gas and Electric Company

BYLLESBY
PIONEERS IN PUBLIC SERVICE
ENGINEERING & MANAGEMENT CORPORATION

serving 1,648 cities and towns of twenty states . . . combined population 6,000,000 . . . total customers 1,617,414 . . . installed generating capacity 1,539,637 kilowatts . . . gross earnings in excess of $150,000,000 annually . . . properties operate under the direction of Byllesby Engineering and Management Corporation, the Company's wholly-owned subsidiary.

● These companies supply transportation services, either street railway, motor coach, or both, in 146 cities and towns . . . There are 1,032 miles of track operated . . . During the year ended December 31, 1930, 2,617 cars and 153 motor coaches carried a total of 525,811,459 passengers.

Yellow

INTRODUCES

an entirely new conception of lightweight, low-cost, mass transportation » » »

A 40 PASSENGER **Gas Mechanical Coach**

Type **"40"**

A 44 PASSENGER **Trolley Coach**

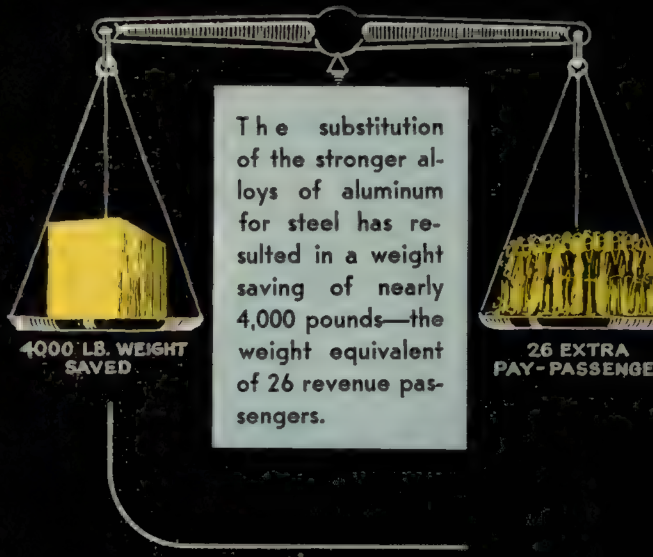
Type **"44"**

IN PRESENTING Type 40—a highly revolutionary advance in light weight, low cost mass transportation—Yellow has successfully assembled time tested mechanical units and proven engineering practices in a new and advanced way.

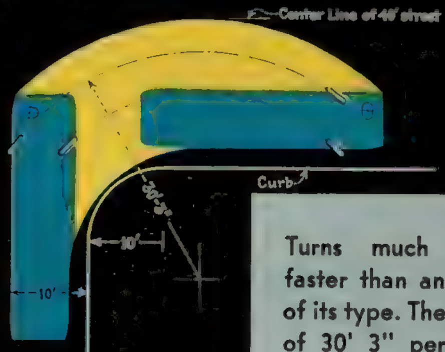
By substituting the stronger but lighter aluminum alloys for steel, nearly 4,000 lbs. of weight has been eliminated—the weight equivalent of 26 pay passengers. This means less weight per pay passenger and a 40 passenger vehicle that is lighter than a conventional 29 passenger coach, with gasoline, tire and oil mileage costs on a comparable level. Low operating costs are thus combined with greater revenue-producing possibilities.

In the rear—close coupled to the rear axle assembly—is the famous 150 h.p. "616" Yellow engine, with conventional clutch and transmission. This arrangement insures higher tractive efficiency . . . equalized tire loads . . . more space for passengers . . . more comfortable seating arrangement . . . better seat spacing . . . a full level floor . . . better headroom . . . insulation from engine heat and freedom from engine odors.

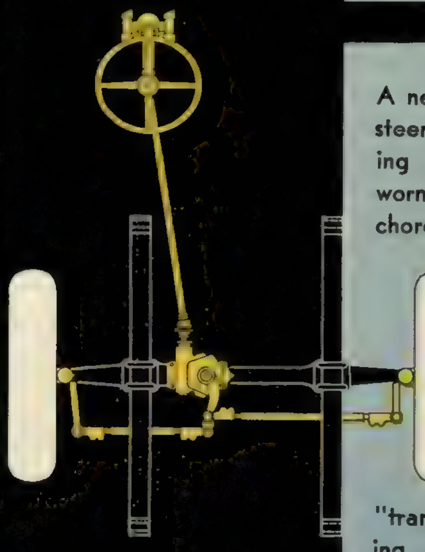
Provision is made for the quick (15 minutes) removal of power plant and the entire drive mechanism as a unit.



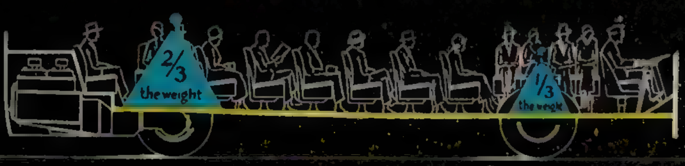
The substitution of the stronger alloys of aluminum for steel has resulted in a weight saving of nearly 4,000 pounds—the weight equivalent of 26 revenue passengers.



Turns much shorter and faster than any other coach of its type. The turning radius of 30' 3" permits rounding the sharpest corners without fouling opposing traffic lanes.



A new development in easy steering and simplified steering gear layout. Steering worm and sector are anchored to front axle with very short links direct to steering arms. The unsupported drag link is eliminated, steering play greatly reduced, shimmy and "tramp" eliminated, steering made extremely easy.



Exactly one-third the weight of the loaded vehicle comes on the front tires—two-thirds on the dual rears. Equalized tire loads insure longer tire mileage. Balanced distribution of weight insures exceptionally smooth, comfortable riding.

Note the level floor without ramps or kick-up and the use of large balloon tires all around.

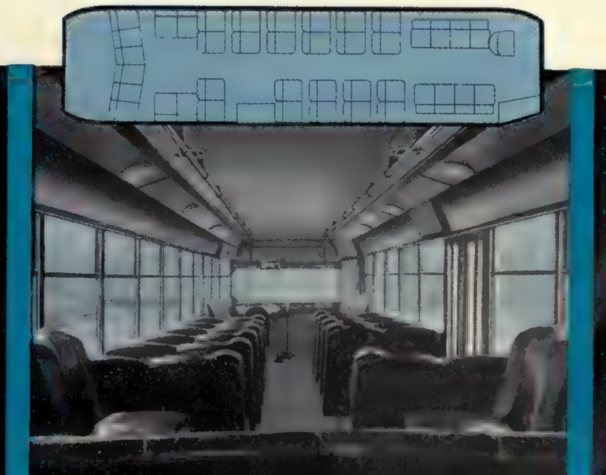
Type 40 can be brought to a smooth stop in its own length from a speed of 26 m.p.h.

There is exceptional provision for driver visibility. Shatter-proof glass is used front and rear.

MEASURE the MERITS

Fifteen outstanding features that build revenue and reduce operating costs.

1. Weight complete with gas, oil and water, only 15,500 pounds. Strong alloys of aluminum have replaced over 6,600 pounds of steel.
2. All metal construction. Fireproof. Lasting.
3. Perfect balance and equal distribution of weight on all tires.
4. A tremendous improvement in steering . . . a truly great engineering advance.
5. A perfectly level floor, without ramps or kick-ups.
6. Ample power—The famous "616" Yellow engine . . . 150 h.p.
7. Power plant and entire drive mechanism installed in rear of coach.
8. Complete insulation and freedom from engine odors, engine noise and engine heat.
9. Power plant and complete drive mechanism removable as a unit in less than 15 minutes.
10. Close coupled drive to axle reduces power losses and maintenance.
11. Short exhaust line . . . to rear of roof . . . reduces back pressure . . . eliminates offensive gases.
12. Real brakes—stops in its own length at 26 m.p.h.
13. Extremely short turning radius . . . 30′ 3″.
14. Wide comfortable seats and seat spacing—plus perfect vehicle balance—insures unusual riding comfort.
15. Exceptional visibility for driver and passengers.



WHERE aluminum alloys are substituted for steel, greater strength and far more liberal factors of safety are provided. It is in the elimination of unnecessary weight that Yellow has exercised the most rigid control. All body and frame sections are of aluminum. Seat weights are less than 20 pounds per passenger. Even the stanchions are of drawn aluminum tubing. These are finished in color and made tarnish-proof and grime-proof by the new Alumilite plating process. In addition to the direct savings in tire, gas and oil costs resulting from exceptionally light weight construction, there are many other advanced features of design that insure lower operating costs.

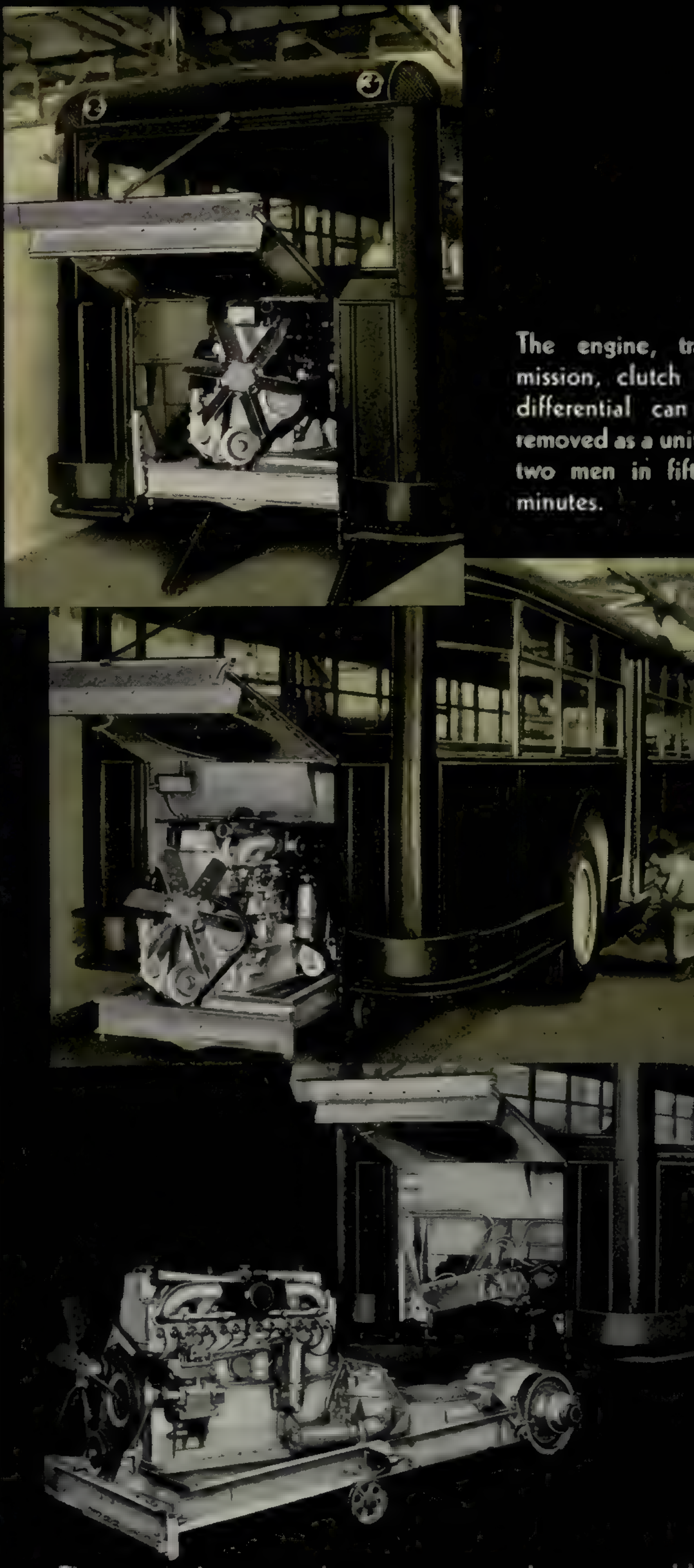
Perfect balance and distribution of load on front and rear axles not only reduces structural stresses but insures equal tire load and more uniform wear. The design also permits the use of the same size balloon tires all around, thus reducing tire inventory charges.

The power plant complete—that is, the engine, the transmission, the clutch and the differential—can be removed as a single unit in fifteen minutes. This is an important feature that greatly reduces layup time and maintenance labor costs because of the better accessibility.

Mounting the power plant and the complete driving mechanism as a compact unit in the rear reduces tractive losses, length of drive, number of parts, weight and maintenance.

The all metal body construction provides longer life, simplified body maintenance and increases the interchangeability of units, with body parts and sections which are standardized and precision built over jigs and fixtures.

Supplementing these important operating ad-



The engine, tr
mission, clutch
differential can
removed as a uni
two men in fif
minutes.

The entire driving mechanism is mounted on a portabl
quick detachable sub-frame fitted with self-centering dowe
which insure perfect automatic alignment.

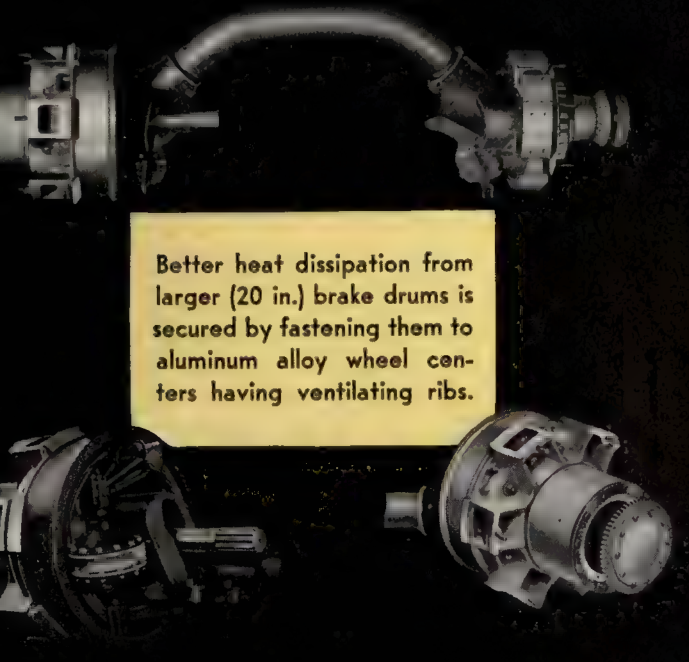
vantages are many revenue building features which contribute to the safety, the comfort and the good will of passengers.

Of particular importance to passenger comfort is the complete freedom from noxious gas and engine odors and insulation from engine heat and vibration. Passenger comfort is further insured by wide, unobstructed aisles, more comfortable seating arrangement, wider seat spacing, exceptional visibility, unusual headroom, a full level floor, large, easy riding balloon tires, deep entrance and exit wells and ample width entrance and exit doors for easy loading and unloading.

Contributing to safer operation are exceptional visibility for the driver, the new General Motors development in simplified steering which eliminates all possibility of shimmy or tramp and prevents transmission of road shocks or vibration to the steering wheel at any speed. The combination of easy, accurate steering and short turning radius in so large a vehicle is causing universal enthusiasm among drivers. The larger capacity brakes give cooler, better acting, noiseless braking and a sure, quick deceleration with lower brake pressure.

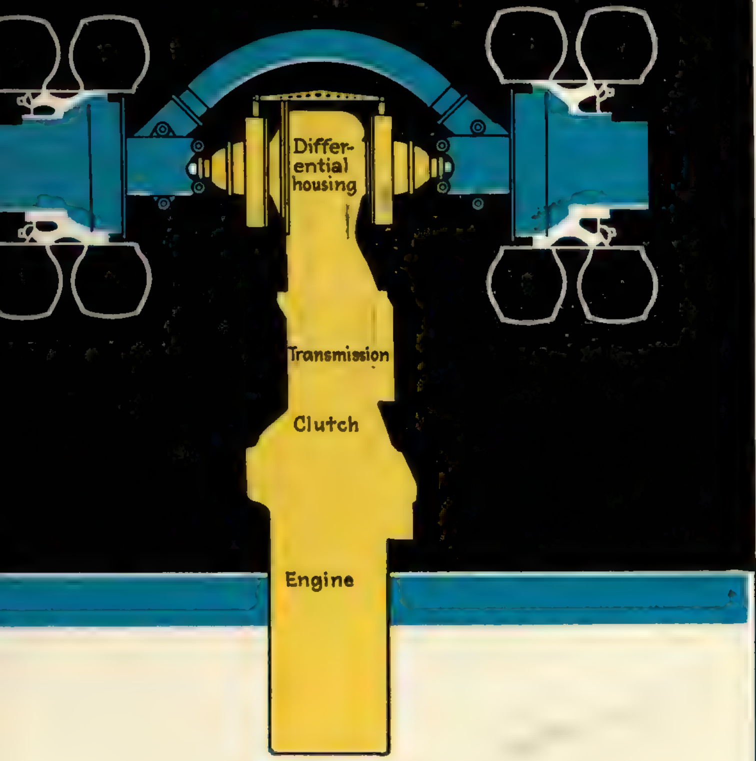
The use of cast aluminum alloy wheel centers with ventilating ribs which enclose the brake drums insures cooler braking surface and at the same time permits the use of large diameter (20") brake drums. The braking system naturally includes Yellow's duplex type brake mechanism with four groove-ventilated 4-inch brake blocks on aluminum shoes.

Thus, by combining in a single design, extraordinary light weight, increased carrying capacity, exceptionally low operating costs, higher revenue possibilities and greater passenger appeal, Yellow has once again made an important contribution to the progress of the industry.



Better heat dissipation from larger (20 in.) brake drums is secured by fastening them to aluminum alloy wheel centers having ventilating ribs.

The illustrations above show the dead rear axle with its wheel hubs and brake mechanism. Pulling out the full floating rear axle shafts leaves the differential, transmission, clutch and engine free for easy removal as a single unit.

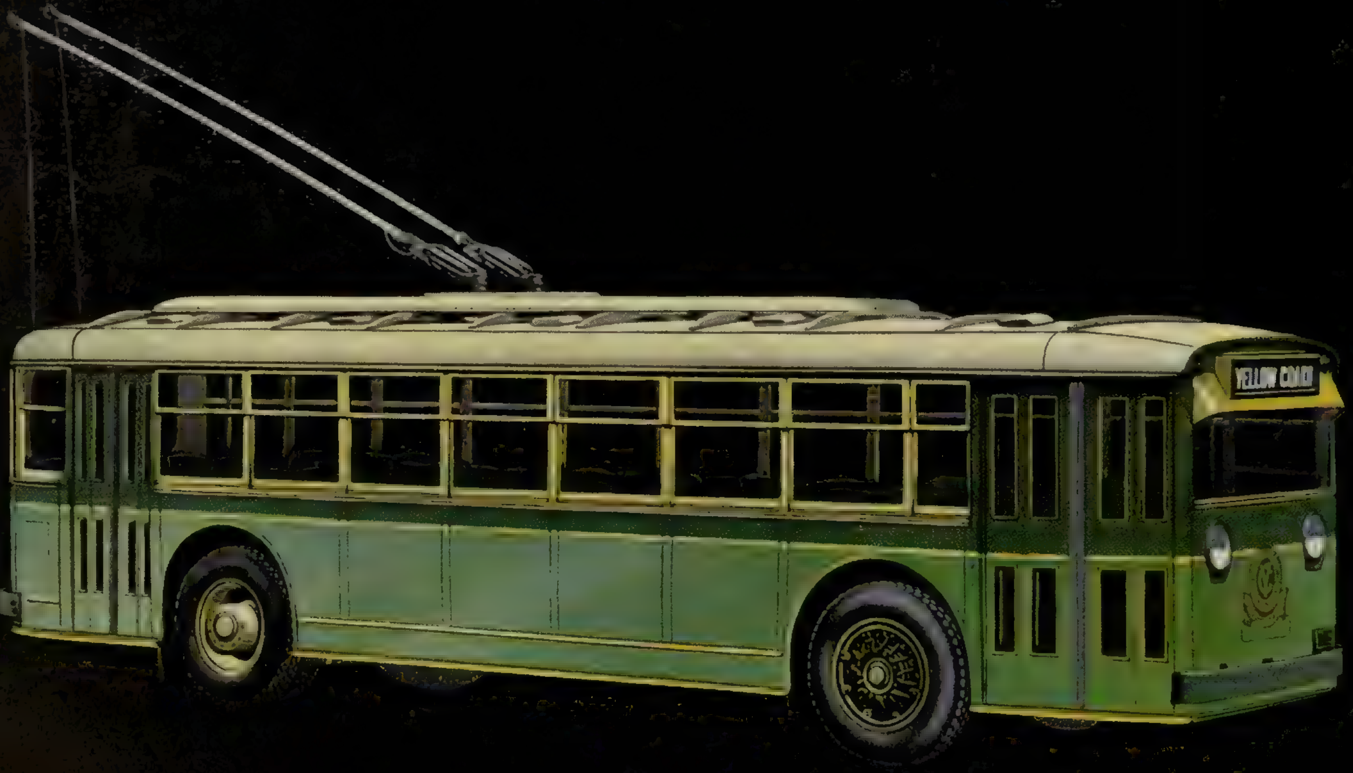


BRIEF SPECIFICATIONS

Wheel base	213 in.
Length over all, including bumpers	33 ft.
Width over all, including tires	96 in.
Head room	78 in.
Engine	150 h.p.
Generator	12 V. 750 Watt
Transmission	4 speed
Brakes	4 wheel air—20 in. gun iron drums—4 in. wide shoes
Brakes, emergency	2 drums on drive shafts
Tires, balloon, front and rear	9.75
Turning radius	30 ft. 3 in.
Total weight, including gas, oil, water	15,500 lbs.

Yellow Type "44" Trolley Coach

Seating 44 passengers



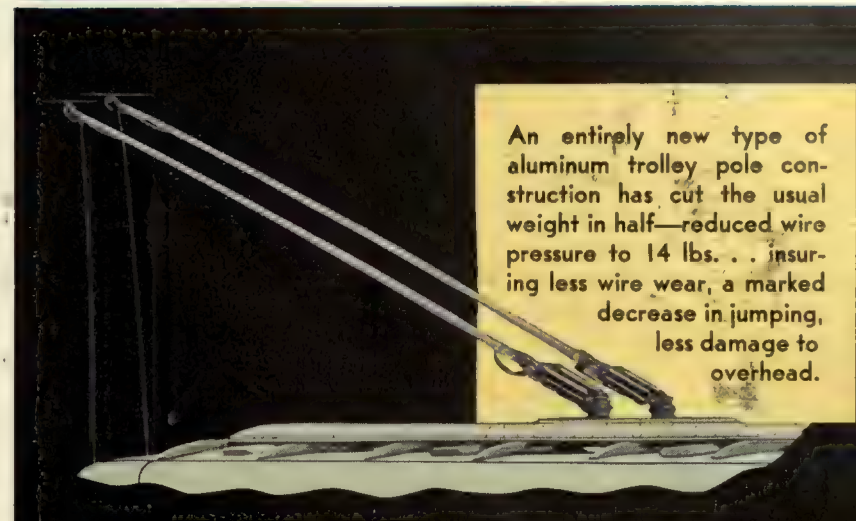
THE Trolley Coach has the same basic design and construction as the Gas Mechanical Coach. Only the power plants and related equipment are different. Otherwise dimensions and weights are identical and virtually all mechanical units and body sections are interchangeable. . . . Conventional engineering practices have been combined with advanced methods of either assembly or design to provide exceptionally low operating and maintenance costs and a new conception of performance and earning power.

THE Yellow Type 44 Trolley Coach has the same distinctive features of construction as the Type 40 Gas Mechani- l Coach—there is the same extensive use of uminum alloys, the same light weight and erfect balance of load, the rear mounting of ual motors and drive mechanism, quickly re- ovable as a single unit, the same full level oor, the new type of easy steering, the venti- ted aluminum alloy wheel centers, the greater ake area and braking power with 20-inch ums.

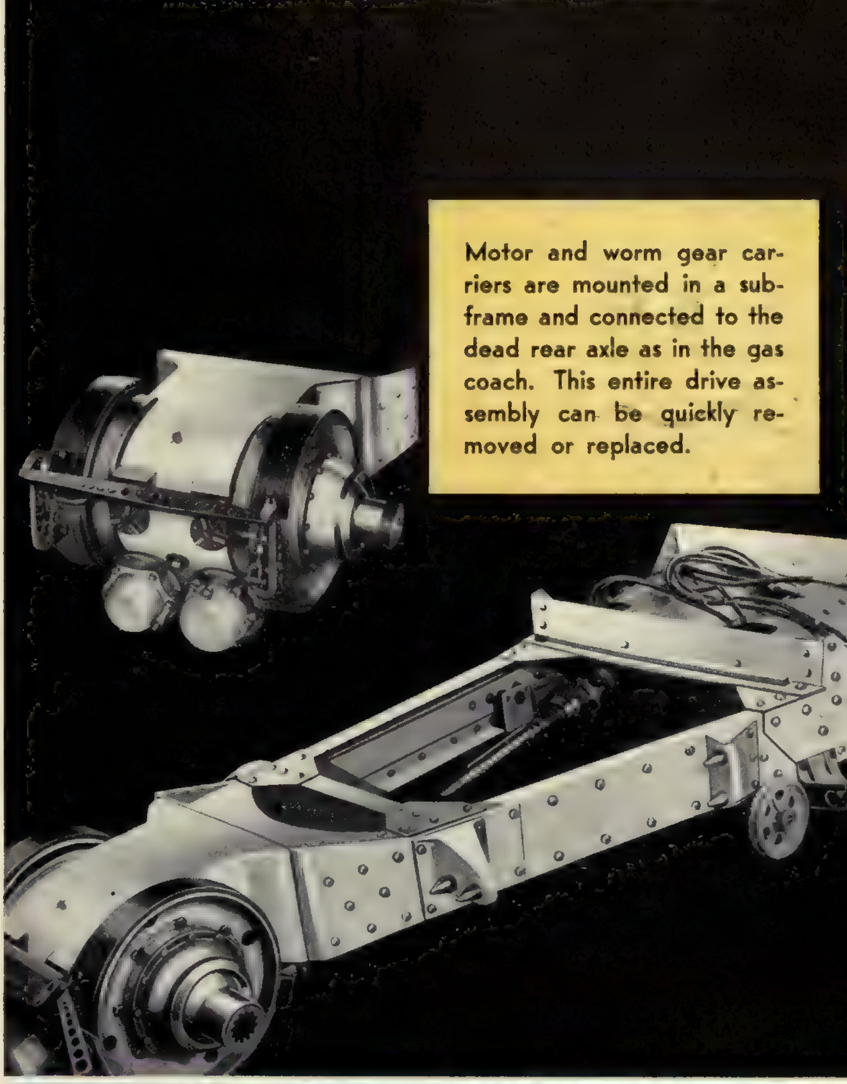
hese features have been combined with a dically new centralized underbody control stem of extreme simplicity, and a new type light weight trolley pole construction that gineers have been striving for years to per- ct. This new type of drawn aluminum trolley ole construction cuts the usual pole weight half, reduces wire pressure to 14 pounds, sures less wire wear, less damage to over- ead, less sparking, permits taking crossovers higher speeds, with less risk of jumping.

he lighter, more balanced weight of the oles and easier action on the wire eliminates oof noise, allows the use of a lighter trolley se and permits the retriever to operate far ore quickly, thus preventing damage to over- ead and reducing rope wear.

ll the electrical control equipment is com- actly assembled, in an insulated container, nder the center of the body where it is easily cessible and fully protected. It is operated cable or rod controls from the driver's at. The lead-ins from the roof are carried rough one of the stanchions direct to the ntroller and three-fourths the usual trolley ach wiring has been eliminated.

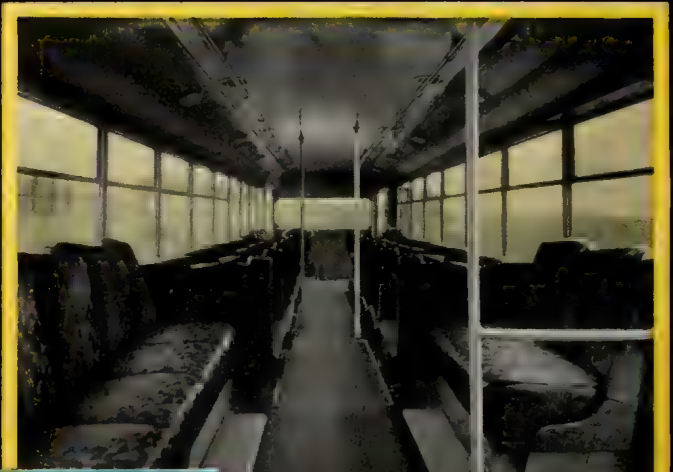


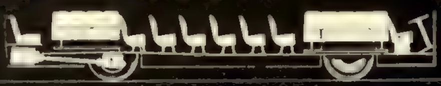
An entirely new type of aluminum trolley pole construction has cut the usual weight in half—reduced wire pressure to 14 lbs. . . insuring less wire wear, a marked decrease in jumping, less damage to overhead.



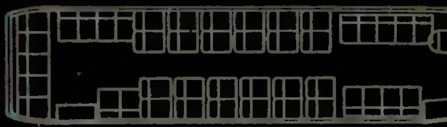
Motor and worm gear carriers are mounted in a subframe and connected to the dead rear axle as in the gas coach. This entire drive assembly can be quickly removed or replaced.

Motors and electrical equipment as specified. General dimensions, construction, weight, tire sizes, brakes and steering, same as in gas mechanical coach Type 40. Detail specifications on request.





The rear mounting of the two motors insures ideal weight distribution—equalized loads, easier steering. Two-thirds the weight of the loaded vehicle comes on the dual rear tires.



This wide entrance door is also available on the Gas Mechanical Coach Type 40.

A 3 h.p. auxiliary motor drives the air compressor, an automotive type generator and the ventilating blower which circulates clean cool air through the control boxes.

Motors are independently ventilated by sirocco fans on each motor shaft with air drawn from roof intakes past motor poles and armatures. This thorough ventilation reduces the chemical decomposition of air or "ozonation," thus protecting the electrical contact surfaces and insuring dependable operation.

And supplementing these major design improvements has been the rigid scientific elimination of all surplus weight, so that new low levels of operating costs could be realized and new and higher standards of performance achieved. The marked reduction in power and tire mileage costs, the great improvement in acceleration and deceleration and ease of handling, the practical provision for low cost maintenance, are all advancements which the industry has been anxiously demanding.

Yellow Type 44 is another great tribute to modern engineering—and an entirely new conception of the performance and earning possibilities of the trolley coach.

YELLOW COACH

GENERAL MOTORS TRUCK CO., *Pontiac, Michigan*

Subsidiary of Yellow Truck & Coach Mfg. Co.

Modern fare collection is *automatic!*

THE AUTOMATIC FARE COLLECTOR
14 OR 16 FOOT CARS WITHOUT CONDUCTOR.
CITY RAILWAY

An 1885 fare collecting device —considered quite satisfactory some forty years ago—for cars *sixteen feet in length.*

PEREY Coinpassors are modernizing fare collection on street cars and buses in all parts of the world. They make fare collection automatic.

Congestion on platforms is avoided. Passengers enter the car quickly, without confusion.

Coinpassors occupy little space, leaving ample room on platform for passengers. Delays in closing doors and getting moving, even with crowds, are eliminated.

With Perey Coinpassors, one-man operation is practical on any size and type car. Platform men remain at their posts without the responsibilities of fare collection. Their only duty as far as fares are concerned is to make change and issue transfers.

And this modern fare collector is safe. Four smooth arms, without angles or corners, move easily as passengers walk through.

And every rider pays his fare—no one can evade the Coinpassor. Every fare is registered by the passenger himself, on a built-in, tamper-proof recording meter, as he passes through the turnstile. Here indeed is protection to revenue.

Let us tell you more about this modern—automatic—method of fare collection.

View showing Perey Coinpassor installed in one of the 150 new coaches purchased by the Brooklyn Bus Corporation.

Perey Turnstiles also include the Perey Coinpassor—the coin controlled turnstile for collecting fares at Subway, Elevated Railway and Pre-payment stations, Perey Passimeters for use in connection with Cashiers' Booths, Perey Electric Coin Boxes and the new Perey Bus Coinpassor. See them at our Booth No. C-319 at A.E.R.A. Exhibit, Atlantic City, or write for full details.

PEREY MANUFACTURING CO., Inc.
101 Park Avenue, New York

ROEBLING

Right from the Trolley or Contact Wire overhead, clear through to the Power Cables underground—every type of wire and cable used by electric railways is included in the Roebling Line. On the one hand there is Roebling Cable for pantographs—and at the other extreme there are Parkway Cables. A glance at the list to the right will give you a fair idea of the diversity of Roebling Wires and Cables for electric railway use.

We would welcome an opportunity to send you further information and to quote on your requirements. The nearest office below is at your service.

JOHN A. ROEBLING'S SONS COMPANY · TRENTON, N. J.
Atlanta Boston Chicago Cleveland Los Angeles New York
Philadelphia Portland, Ore. San Francisco Seattle Export Dept., New York, N. Y.

Railway Signal Wires and Cables » Parkway Cables » Power Cables; Paper, Cambric, Rubber; Braided or Leaded » Car Wire » Locomotive Wire » Bronze Trolley and Contact Wire » Copper Trolley and Contact Wire » Copper Transmission Strand » Guy Wire and Strand » Bond Wires » Ground Wires » Welding Cable; Trailing and Electrode Holder » And a wide variety of other Wires and Cables.

ELECTRICAL WIRES AND CABLES

Youngstown standardizes on

TUCOLITH

. . . for new cars—modernized cars—buses

TUCOLITH features:

1. Long life
2. Attractive appearance
3. Non-slip surface
4. Fireproof
5. Sound deadence
6. Sanitary

Municipal Railway modernizes flooring for safety and cleanliness

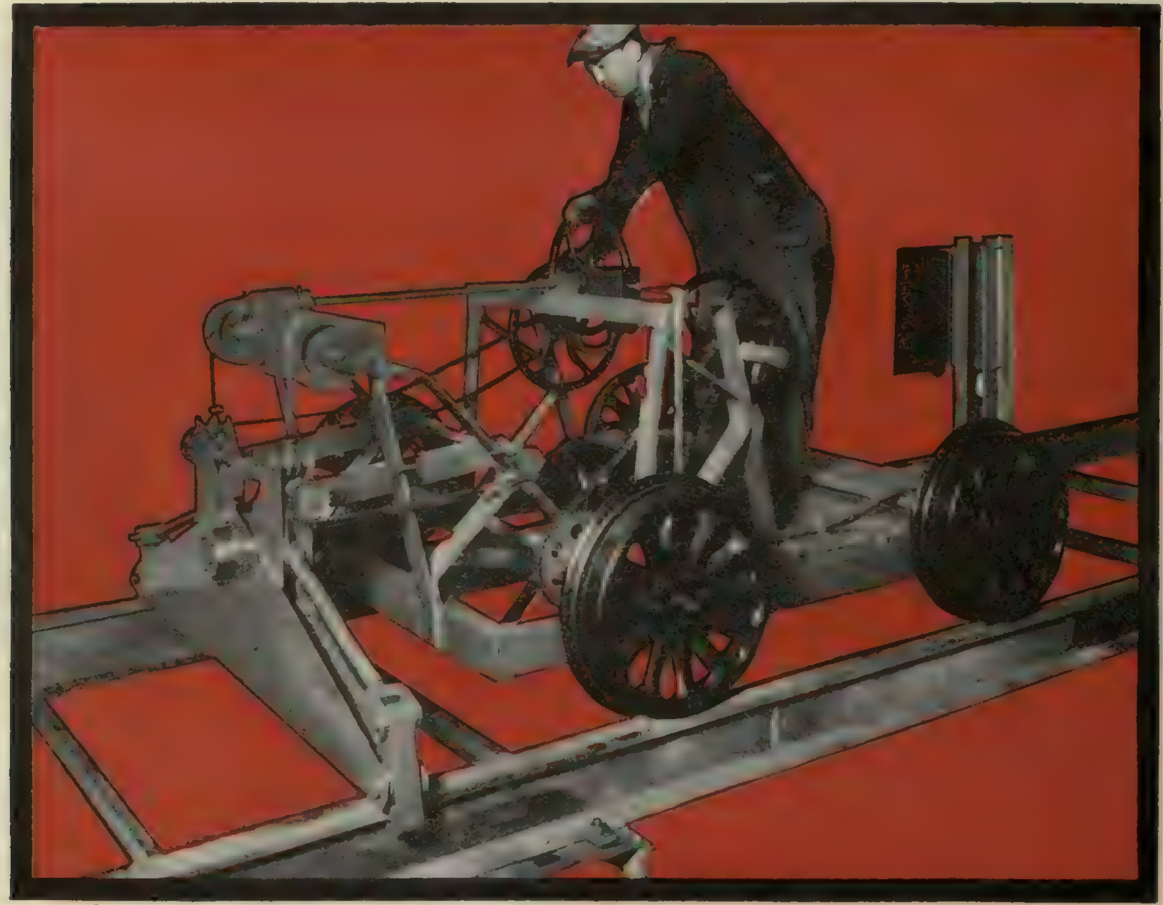
Progress in achieving greater safety to riders and employees has been an important contribution of Youngstown Municipal Railway to the Electric Traction Industry.

Experiments conducted on this property to develop proper floors from the standpoints of attractiveness, cleanliness, safety and low maintenance have led to the adoption of TUCOLITH as the standard flooring for cars and buses.

TUCO PRODUCTS CORP., 30 Church St., New York
Peoples Gas Bldg., 122 S. Michigan Ave., Chicago

TUCOLITH
FLEXOLITH

The "Economy"



See Track Cost Reducing Devices

ATLANTIC CITY—SEPT. 26 TO OCT. 2
SPACES D401-403-405

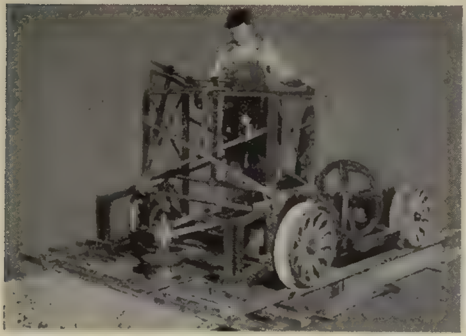
FEATURES OF TRACK CONSTRUCTION YOU WILL SEE DEMONSTRATED AND DISPLAYED IN THIS EXHIBIT

1. **The "Mortar Flow" Machine working on freshly mixed concrete.**
2. **The New Vibratory Type Screed for finishing concrete paving and spreading concrete in all types of construction—full electric operation—one man.**
3. **Section of Heavy Duty Track that cost less than $6 per foot.**
4. **The D.S.R. Track Layer and the Electric Bolt Tightening Machine which assist in making Twin Tie Track the most economical paved construction.**

THE INTERNATIONAL

Riders—*How to hold 'em*

Bolt Tightener



New Screed shown for the first time.

Track Layer

IT'S your big chance this year to get back some business that seemed gone forever—the business that was lost to the private automobile.

Millions of people now can't afford to drive automobiles as they used to. They are riding street cars in increasing numbers. Maybe you can't see it in your figures because unemployment has made a big reduction in necessity riders.

Nevertheless these new customers are now in your salesroom. You have a chance to give them a sample—to sell them permanently.

But their standards of riding comfort, speed, quietness and rapid pick-up are high.

Only the best equipment and rapid schedule speeds on smooth, quiet track will make them like their economical street car ride better than the nerve cracking job of bucking the traffic jam with an automobile.

Modernized paved track can be built cheaper *now* than ever.

***We can show you at Atlantic City* (or in your office) actual cases of heavy duty, city track laid this year for less than $6.00 per foot—track that is good for 20 to 30 years; exhibited in full size detailed cross section in Spaces D-401-403-405.**

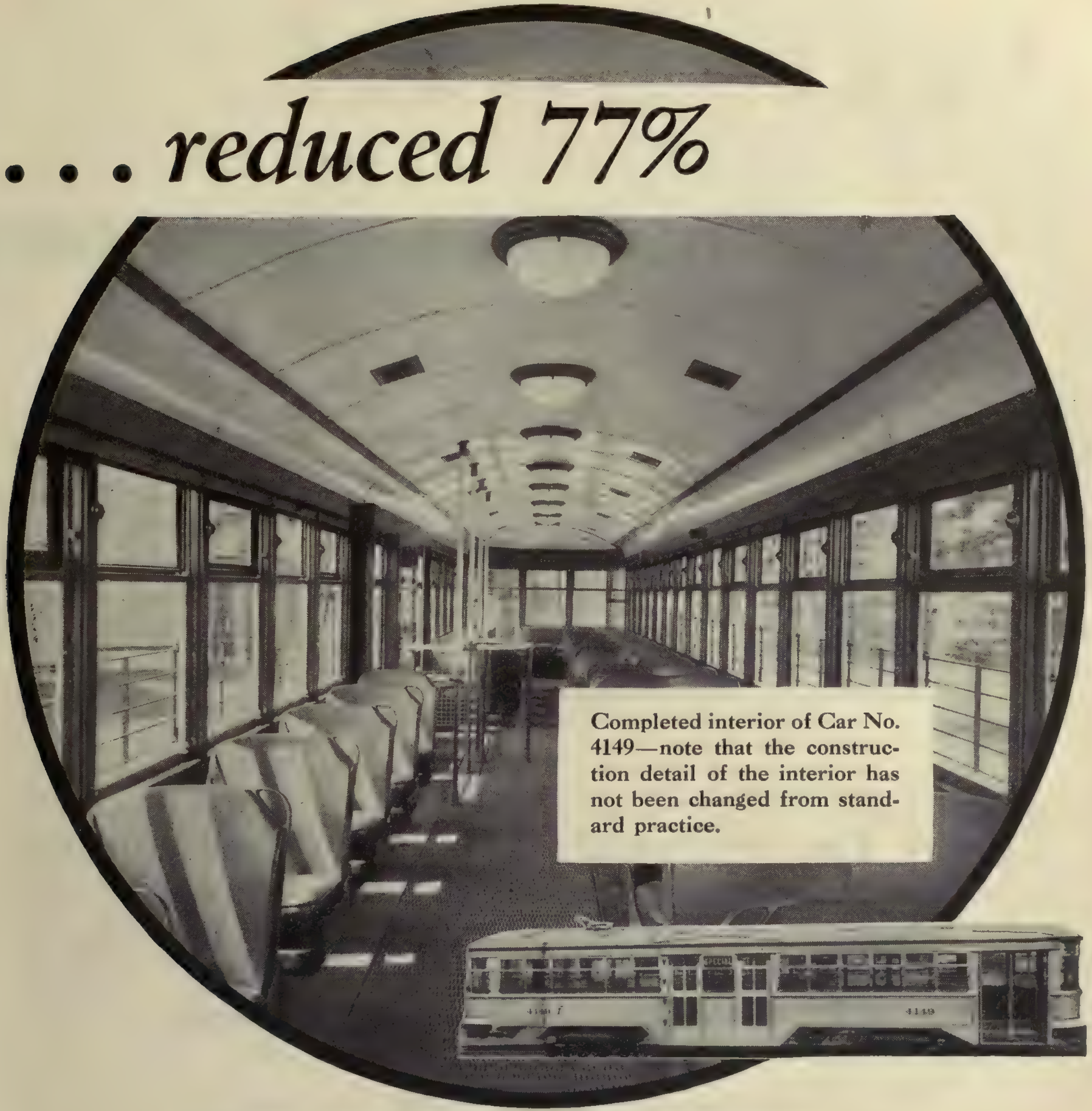
STEEL TIE CO. *Cleveland, Ohio*

Nerve-racking noise

Floors, sides, rear end and roof deck of Car No. 4149 of the Cleveland Railway Company being insulated and acoustically treated with J-M Sound Absorbing Materials.

JOHNS-MANVILLE JM PRODUCTS Johns-Manville

. . . reduced 77%



Completed interior of Car No. 4149—note that the construction detail of the interior has not been changed from standard practice.

Johns-Manville can help you attract new patronage and added revenue by quieting your cars

PRACTICALLY every large traction company in the country has recognized the vital need for the elimination of nerve-racking noise so disturbing to passengers. These traction companies have realized, without exception, that quiet and well-insulated cars are a most aggressive step toward meeting their competitive conditions.

One of the most important companies in the East has learned by *actual tests,* that cars acoustically treated and insulated according to the specifications of Johns-Manville engineers are 67% to 77% less noisy than uninsulated cars put into service at the same time. In addition these cars were cooler in summer and warmer in winter. Acquaint yourself with the details of this significant development—address Johns-Manville, 292 Madison Avenue, New York City.

Service to Transportation

Next Month!

—The CONVENTION

Will bring you a full and accurate account of all the important happenings at Atlantic City during this busy week of the Golden Jubilee.

■ The big exhibit will be illustrated and described. The 50th Annual Convention will be recorded. Outstanding features and discussions of this most important of all gatherings of community transport interests will be authoritatively set forth.

ELECTRIC RAILWAY JOURNAL, McGRAW-HILL BUILDING,

REPORT NUMBER

Not for a long time will there again be available such a comprehensive report issue, covering as it will concurrent meetings of both A.E.R.A. and N.A.M.B.O. and the great exhibit in Convention Hall.

■ Requests for additional copies of the Convention Report Number should be made as early as possible.

■ The issue will be mailed to subscribers October 10. Advertising forms will close October 2.

■ **TO ADVERTISERS:** ***Interest in this particular Convention Report Number will extend beyond usual limits. Its reference value will insure its retention and use over a longer period of time.***

TENTH AVENUE AT 36TH STREET, NEW YORK

for curtains and upholstery . . .
PANTASOTE

AGASOTE
for panel board and roofing . . .

Since 1897 there has been no substitute for PANTASOTE

Five—ten—fifteen years!

Continuous use of any product over such a period of time is a reasonable assurance of satisfactory service.

Extend this time to 34 years—when PANTASOTE was first offered—consider the rough treatment received at the hands and *feet* of car crowds—the scorching heat of many summers—the mud and slush of stormy winters . . . . and a picture of almost unbelievable durability is apparent.

Small wonder that the acceptance of PANTASOTE is so universally wide—that the operating companies which carry the heaviest traffic should long ago have proved the sound economy of standardizing on PANTASOTE PRODUCTS for car seats, curtains, headlining, etc., for their cars and buses. These operators buy on ultimate cost and many of them have yet to find out what this is—they are fully aware that PANTASOTE has long since paid for itself.

PANTASOTE has proved itself economical in maintenance. It is easily cleaned, impervious to sunlight or water. It will not harden, crack or peel. It is non-inflammable.

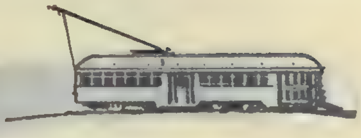
Then, too, AGASOTE—for years the choice of electric railway companies as the durable, economical material for car roofs, panelling, etc.

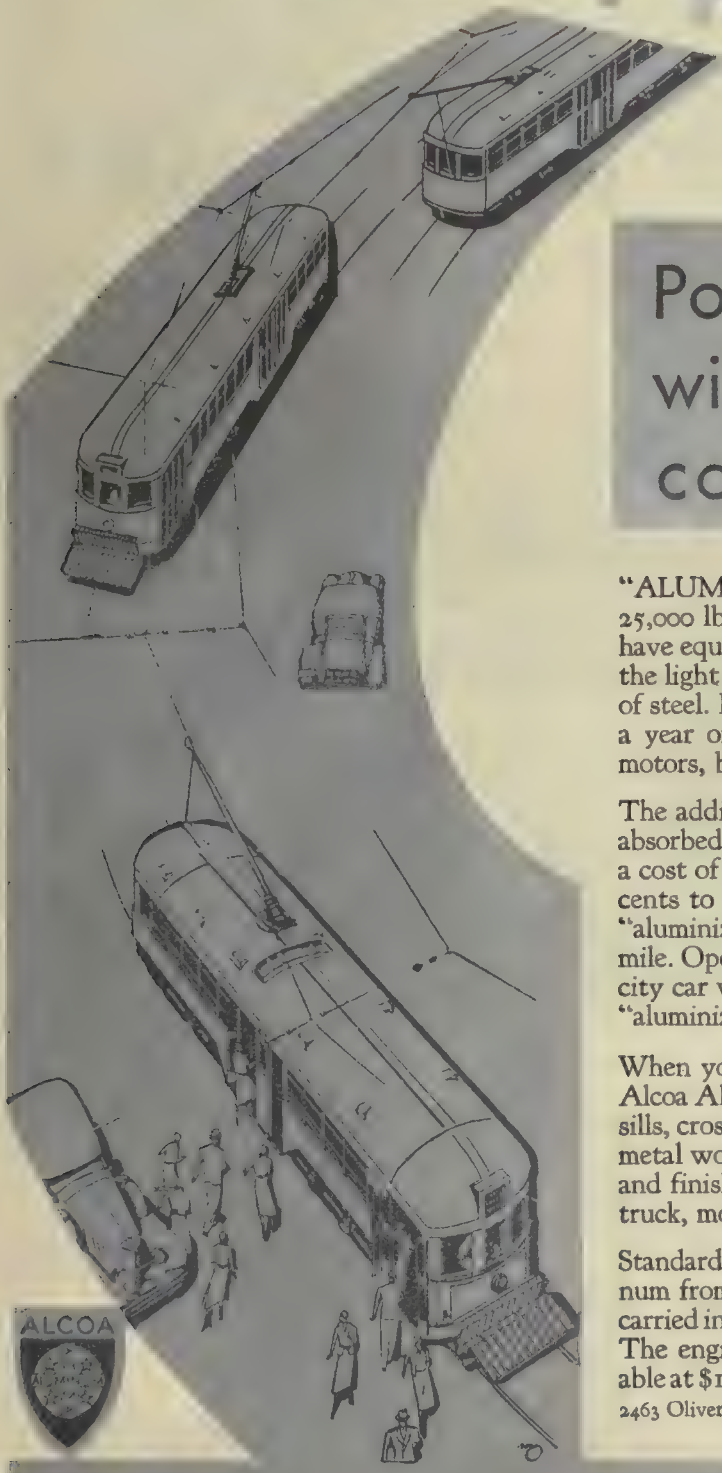
AGASOTE offers every desirable quality of wood or steel with none of the disadvantages. It cannot split, warp or peel. It is unaffected by heat, cold or frost. It is permanently waterproof. It is sound absorbing and an insulator. AGASOTE is available in standard dimension sheets or is cut and shaped to your exact specifications.

34 years and no substitute of equal quality and cost for PANTASOTE PRODUCTS—a fact which can spell economy for you, too, when you standardize on PANTASOTE and AGASOTE for your cars and buses.

THE PANTASOTE COMPANY, INC., 250 Park Avenue, New York

Double truck city cars weigh
11,470 lbs. less
"ALUMINIZED"





Power savings alone will absorb the extra cost in 33 months

"ALUMINIZED," the average double truck city car can weigh 25,000 lbs. instead of the usual 36,470 lbs. "Aluminized" cars have equal strength and are over 5 1/2 tons lighter. 6,600 lbs. of the light strong alloys of Alcoa Aluminum displace 18,400 lbs. of steel. Result, the "aluminized" car, lifting 229,400 ton-miles a year off your tracks, cuts power costs, wear and tear on motors, brakes, etc.

The additional cost of "aluminizing" double truck city cars is absorbed in 33 months by savings in power costs alone. Based on a cost of .138 cents per 1,000 lbs. of car per mile, it costs 5.03 cents to move the old fashioned (36,470 lbs.) car 1 mile. The "aluminized" car weighing only 25,000 lbs. costs 3.45 cents per mile. Operating the usual 40,000 miles per year of double truck city car work, this power saving of 1.58 cents per mile by the "aluminized" car results in a power saving of $632 per year.

When you "aluminize" you can use the light strong alloys of Alcoa Aluminum for under frame, including body bolsters, side sills, cross members and apparatus supports. Use it too for all metal work in the body, including side plates, end plates, roofs and finish inside and outside. It can also be used for numerous truck, motor, and apparatus parts.

Standard structural shapes of the strong alloys of Alcoa Aluminum from which street cars and railway coaches are made are carried in stock. Plates, rivets, bolts and screws are also available. The engineering handbook, "Structural Aluminum," is available at $1.00 a copy. Address ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA

ALCOA ALUMINUM

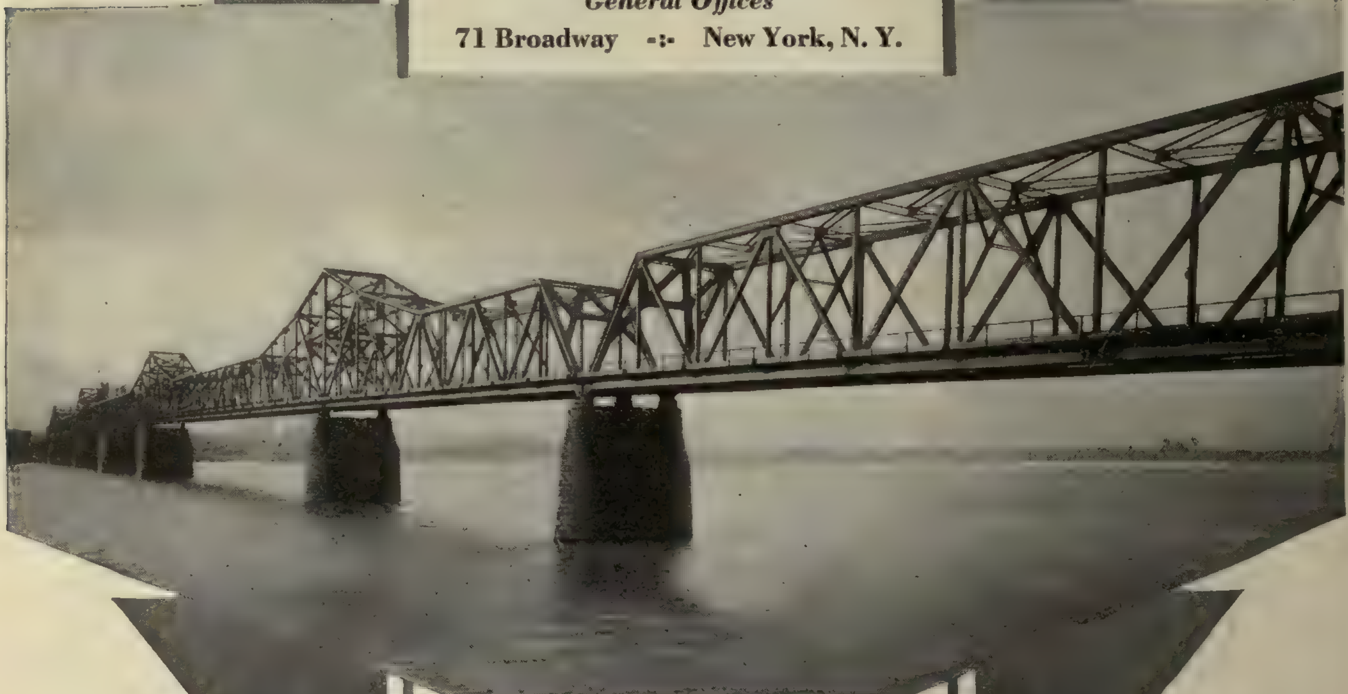
ANOTHER LARGE HIGHWAY BRIDGE
over the
OHIO RIVER
(Illustrated Below)

was opened to traffic the latter part of 1929. This bridge for the Louisville Bridge Commission, is 3740′ long, connecting Louisville, Ky., and Jeffersonville, Indiana. The fabricated structural steel in the superstructure was furnished and erected by

AMERICAN BRIDGE COMPANY

Subsidiary of
United States Steel Corporation

General Offices
71 Broadway -:- New York, N. Y.



RALPH MODJESKI FRANK M. MASTERS
Engineers

This structure consists of two cantilever structures,—each made up of one anchor arm 362 feet, one anchor arm 500 feet, two cantilever arms each 224 feet, and one suspension span 373 feet,—and one simple span 373 feet, similar to suspension span; one roadway and two sidewalks.

We manufacture STEEL STRUCTURES of all classes, particularly

BRIDGES and BUILDINGS

CONTRACTING OFFICES:
NEW YORK BOSTON BALTIMORE PHILADELPHIA PITTSBURGH CLEVELAND CINCINNATI
DETROIT CHICAGO ST. LOUIS DULUTH MINNEAPOLIS SALT LAKE CITY DENVER

Pacific Coast Distributor:
Columbia Steel Company
San Francisco, Calif. Los Angeles, Calif. Portland, Ore.
Seattle, Wash. Honolulu, T. H.

US STEEL

Export Distributor:
United States Steel Products Company
30 Church Street
New York, N. Y.

Thirty-five new light-weight cars of Indiana Service Corporation—equipped with Commonwealth Trucks

These trucks are built to slash maintenance costs and speed up operation.

This is accomplished:

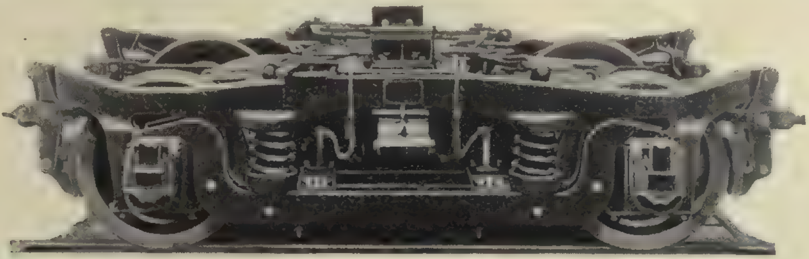
By the use of a strong, light-weight steel frame cast into a single compact, powerful unit (including pedestals and end transoms).

By proper equalization and swing motion. By reducing the weight to an absolute minimum while increasing the strength.

80 *miles an hour*

Eighty miles an hour may not be on your schedules, but these trucks are designed for fast rail transportation.

The selection of Commonwealth Trucks for these light-weight high-speed interurbans—is a real indication of the many advantages obtainable by the use of this construction.



Commonwealth

Swing
Motion
Type

Trucks

GENERAL STEEL CASTINGS CORP.

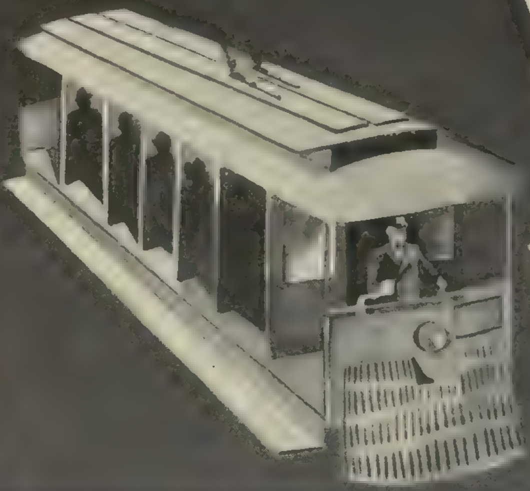
GRANITE CITY, ILLINOIS ***EDDYSTONE, PENNSYLVANIA***

PROGRESS

In 1886—most any kind of track sufficed for the horse-car. » »

With the electric car came the wood tie on gravel ballast for resiliency. » » » » »

Then the wood tie and concrete base, combining resiliency and stability. » » » » » » » »



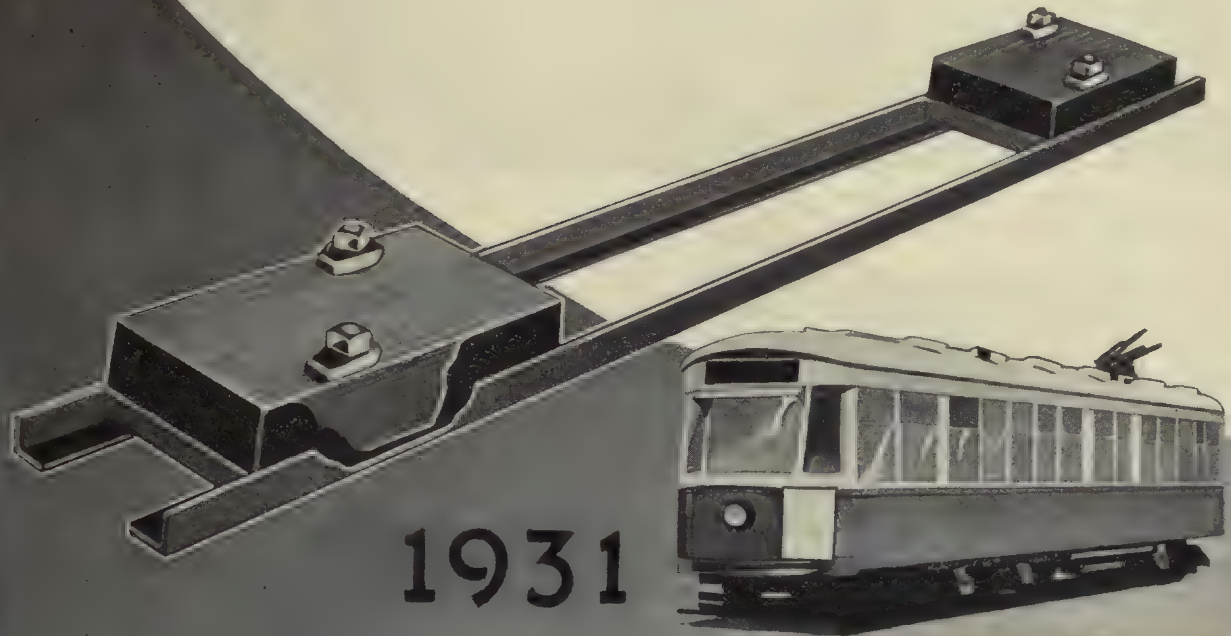
Then the steel tie for reinforcement. » » » » » » » »

THE DAYTON
DAYTON,

MUST BE SERVED

The Dayton Tie came into being just as naturally as the butterfly from the cocoon. It is a direct outgrowth of a natural sequence of developments in the evolution of the street-car and the rail structure. In this tie, resiliency—smooth riding—which has made the wood tie an accepted standard for years—is retained in its full capacity, but to it has been added the advantages of steel reinforcement demanded by the problem of the paved street. Thus in one tie—progress finds its fullest development—a tie that meets every demand of today and meets it more economically.

We take pride in the privilege of having shared so largely in this service to progress.



1931

The Dayton Tie—combining the advantages of resiliency in the block, reinforcement in the concrete—permanent protection to the pavement—virtual elimination of maintenance—low installation cost.

MECHANICAL TIE CO.
OHIO

THE FINEST POLE · · · · · · ·
· · IN 50 YEARS OF AERA HISTORY

In Topeka, Kas., Union Metal Poles support trolley span wires, street lights and traffic signals. Note absence of guy wires

BACK in the horse-car days there was no need for poles for trolley-span wire support. With the advent of electric cars poles became a necessity. Those used in the early days were crude compared with the Union Metal Fluted Poles of today. Sturdy, graceful, dignified, these poles do their work efficiently and at the same time beautify the streets.

When the A. E. R. A. celebrates its centennial in 1981 Union Metal Poles now in service will still line the curbs of American cities.

Fluted Poles have been termed the ideal for street railway service. They are rugged, long-lived; their flexibility enables them to carry abnormal wind or ice loads without taking a permanent set; they are simple to install and maintain; moreover, their appearance, far superior to any other pole, helps build good will for the owners.

Progressive street railway companies in dozens of our largest cities are using Union Metal Poles. They realize that in the 50 years of A. E. R. A. history no finer pole has been built.

THE UNION METAL MANUFACTURING CO., General Offices and Factory: CANTON, OHIO

Sales Offices: New York, Chicago, Boston, Los Angeles, Atlanta, Dallas, San Francisco ● Distributors: Graybar Electric Company, Inc.; General Electric Merchandise Distributors. Offices in all principal cities.

Abroad: The Canadian General Electric Co., The International General Electric Co., Inc.

UNION METAL
DISTRIBUTION POLES

MODEL "40" **Twin Coach** 38-40 PASSENGER

As New York Goes— So Goes The Nation

IN 1927 WE stated in our Sales efforts that we believed that motor coaches with motors out in front of the driver would become obsolete.

WE ALSO declared motor coaches must be standardized in design—eliminating *successive* new models the causes of *excessive* depreciation.

NEW YORK—through great B. M. T. Corp.—has purchased 150 Twin Coaches—and New York always buys, in wearing apparel, motor cars, architecture or what not, only that which is most modern and the last word!

WE ASK YOU for a fair answer! Has not Frank R. Fageol's foresight and ability again been indisputably proven?

TRANSPORTATION economics are the corner stones of his bustling factory at Kent, conceded everywhere to be about the busiest plant folks run across these days.

As Frank Fageol Leads—
So Follows An Industry

1927 TWINS—Approved As A Real Advance

1928 " —Recognized As A New Standard

1929 " —Shattering Old Depreciation Beliefs

1930 " —Unchanged In Basic Design

1931 " —The Most Imitated Coaches In America

★ Present Life Will At Least Be Doubled
★ Older Units Are Hard To Tell From The New
★ All Improvements Designed For Application To Units In Service

PRINTED IN U. S. A.

MODELS 20 & 30
Twin Coach
20-27 PASSENGER

Again
ART RATTAN
Seats are selected

This Time for
Brooklyn Bus Corporation's
Severe Service in
Greater NEW YORK

When it came to the selection of seats for the extremely severe service of the Brooklyn Bus Corporation in Greater New York—Art Rattan seats were picked for the 150 Twin Coaches ordered by B.M.T.

Again Art Rattan seats are the first choice for Buses which will be subjected to heavy traffic and hard wear. And Again Art Rattan low maintenance costs are responsible for their selection on a tough assignment.

Whether you order 10 or 100 Buses you can rely on lower maintenance costs and continued rider patronage with Art Rattan Seats. Art Rattan not only builds durable, comfortable seats but originates designs which later have a habit of becoming extremely popular.

Why not give your Buses the added advantages that Art Rattan Seats offer—in comfort, in durability, in low upkeep.

ART RATTAN WORKS, Inc
CLEVELAND, OHIO OAKLAND, CALIFORNIA

BUILDERS OF DE LUXE BUS AND STREET CAR SEATS

B. M. T.
&
BROOKLYN BUS CORPORATION

One of the 100 luxurious new Twin Coaches recently added to the large fleet of the Brooklyn Bus Corporation, which will be Socony lubricated

SOCONY

NEW YORK'S two great transit systems, comprising subway, elevated, surface car and bus lines . . . the B. M. T. and the I. R. T. . . . carry approximately 75 per cent of the total traffic of Greater New York. With more than six million people dependent upon these two systems daily, schedules must be maintained. The slightest delay is serious.

For years Socony products and Socony engineers have helped these two great systems keep up schedules and hammer down maintenance costs by keeping rolling stock out of the repair shop. Socony is proud that for so vital a factor in efficient operation as lubrication, Socony lubricants were chosen to lubricate the rolling stock and power plants of the two systems.

SOCONY *Motor Oils and Gasoline*

STANDARD OIL COMPANY OF NEW YORK

Interborough Rapid Transit

serves New York's great transportation systems

Socony service is more than the delivery of an outstanding product. It begins long before the first order is received, and does not end with delivery. Socony lubrication engineers are at your service at any time. They will study your lubrication problems with reference to the special conditions surrounding them. They will give you a comprehensive report and recommendations as to the type of lubricants which will give the maximum efficiency. The B.M.T. and I.R.T. systems are only two of many examples...Why not let one of our engineers make a survey of your requirements? A Socony Lubrication Survey costs you nothing and may save you thousands.

SOCONY *Industrial Lubricants...*

STANDARD OIL COMPANY OF NEW YORK

MEETS RIGID REQUIREMENTS OF GREATER NEW YORK TRANSPORTATION

CLETAN

It is significant that Cletan should be the unanimous selection for service as severe as that accorded Twin Coach Buses in the Brooklyn district of Greater New York.

Cletan—a quality leather, strong and durable is essential to the tough service and abuse the seats will receive on these Brooklyn Bus Corp. lines.

MANUFACTURERS OF
CLETAN
TRADE MARK
CHROME TANNED

Cletan offers real rider appeal, and most important in this case, freedom from constant, costly maintenance and longer life under rough use.

If you are interested in quality leathers—designed to meet your particular conditions—investigate Cletan.

See Our Exhibit—AERA Convention, Sept. 26 to Oct. 2
Space E. 609

CLEVELAND TANNING COMPANY

Denison Ave. & Jennings Road, Cleveland, Ohio

THEN

Times have changed. The brake shoe needed to stop this car would *not* do in today's service.

· NOW ·

TODAY'S service is composed of fast starts and quick stops. A greater demand is made on the braking equipment and a better brake shoe is needed. Diamond-S brake shoes answer the need of modern conditions. They embody the results of years of experiments and experience. For the best and most economical results, use Diamond-S brake shoes.

THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

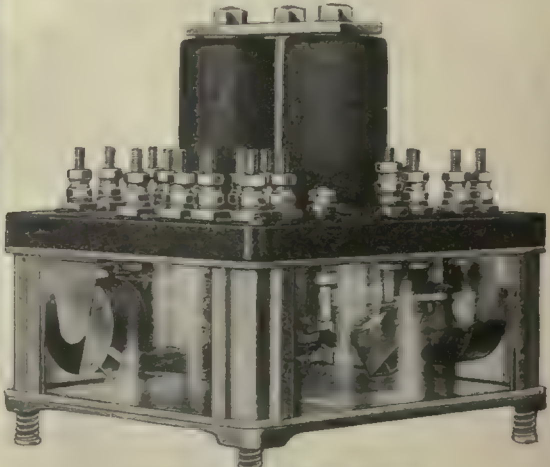
230 PARK AVE., NEW YORK
332 SO. MICHIGAN AVE., CHICAGO

TRACK AND SIGNAL MATERIALS

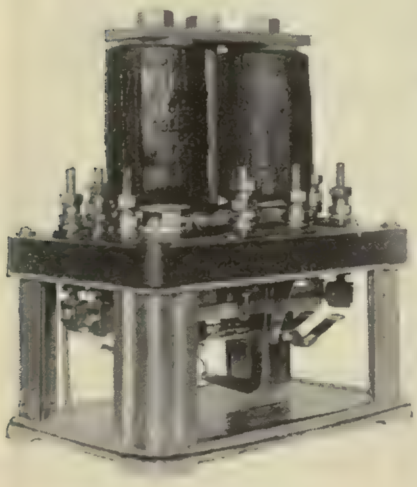
Crossings; Frogs; Switches; Gauge Rods; Reflex Signs; Flashing Light Signals; Track Instruments; Relays; Castings; and other Accessories

We offer you materials of the highest quality for your signal installations. Long years of service have proven the efficiency, durability and quality of our products. Now used on many of the largest railroads in this and foreign countries.

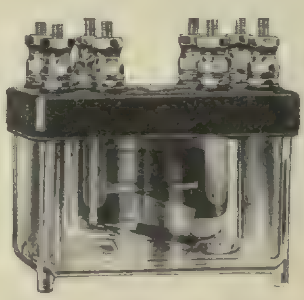
Two Directional Fusticlo Rail Contactors Used as Combination Cut-Outs and Starters. Also Shows Parkway Outlets.



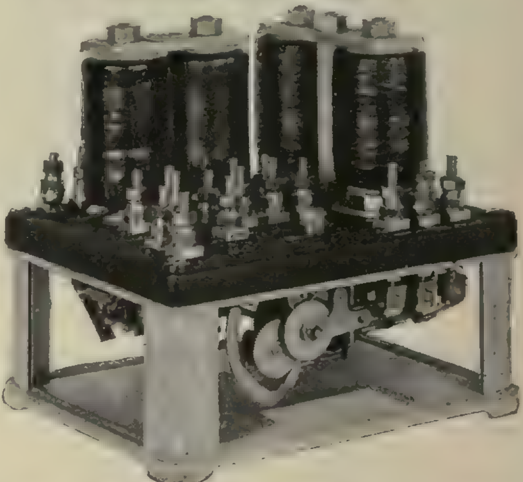
C-7 Automatic Time Release



C-1 Flashing Relay



D-1 Power Transfer Relay



C-3 Flashing Time Relay

Reflector Sign

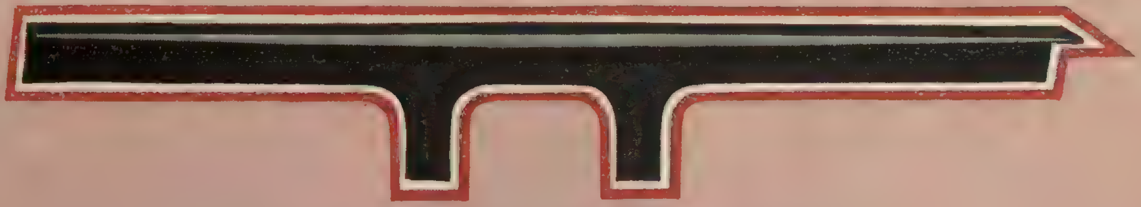
Flashing Lights With Battery Case

Reflector Switch Lamp

Further information will be furnished on request.

LOUISVILLE FROG, SWITCH & SIGNAL CO., Louisville, Ky.

TRUE TEMPER TAPERED RAIL JOINT SHIM



The Remedy for Low Joints caused by wear

The above shows Joint Shim in position with angle bar removed.

The above shows Joint Shim in position between Bar and Ball of Rail.

Other True Temper Products for Electric Railway Use:

- Safety Rail Forks
- Railroad Scuffle Hoes
- Ice Chisels
- Road, Gravel and Cleaning Rakes
- Sidewalk Cleaners

Send for a free copy of our Catalog RAD1, which describes these and other True Temper Products for Electric Railway use.

THE AMERICAN FORK & HOE COMPANY

General Offices: CLEVELAND, OHIO; Factory: NORTH GIRARD, PA.

District Offices
253 Broadway, New York, N. Y. Daily News Plaza, Chicago, Ill.
Representatives at
Boston, Denver, Detroit, Louisville, Minneapolis, St. Louis and San Francisco
Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N. Y., and
68-72 Windsor House, Victoria St., London, S.W.-1.

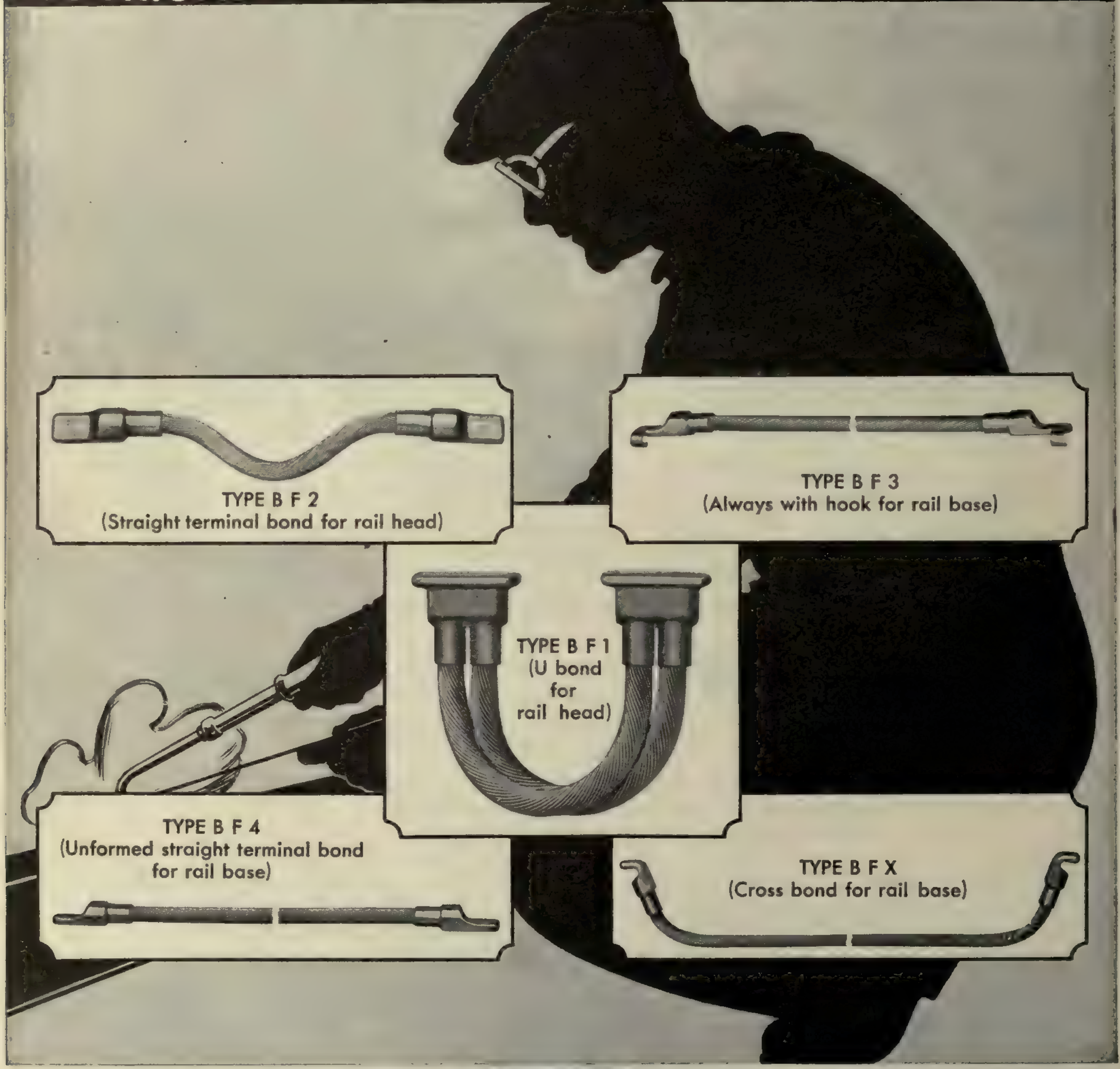
TIGER WELD

FLASH ~ BUTT-WELDED

POWER BONDS

THIS latest and most significant advance in power bond design assures welding simplicity and economy never before realized — as well as higher resistance to vibratory stresses. By newly developed manufacturing methods, the wires are intimately flash butt-welded to solid soft steel terminals, making it easy for any welder to give you better installations at lower cost. Five types — adaptable to flame or arc welding — each bond stretch-tested to insure positive unity. Full particulars and samples on request. Address the nearest office.

A TRIUMPH IN PERFORMANCE AND ECONOMY



TYPE B F 2
(Straight terminal bond for rail head)

TYPE B F 3
(Always with hook for rail base)

TYPE B F 1
(U bond for rail head)

TYPE B F 4
(Unformed straight terminal bond for rail base)

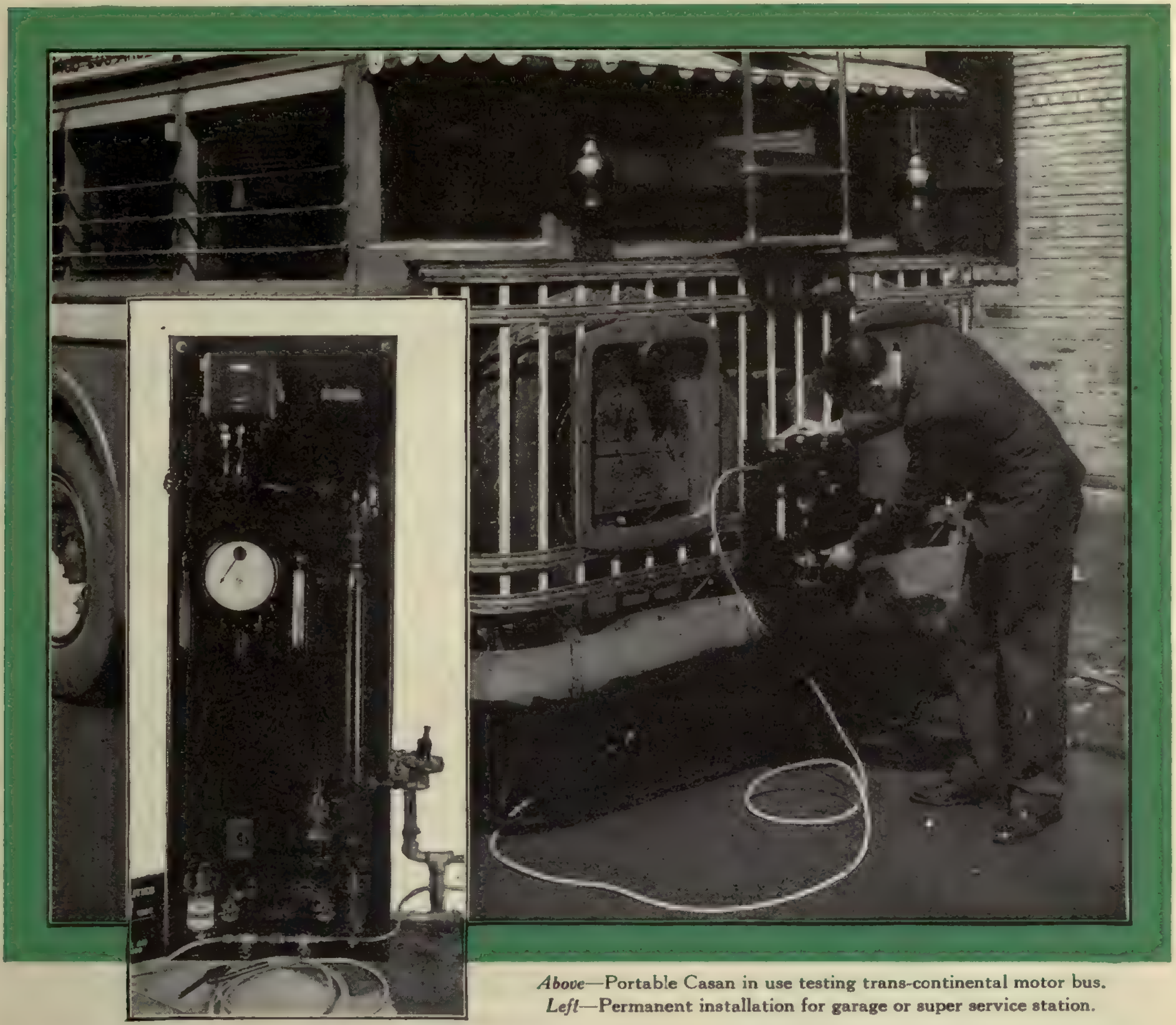
TYPE B F X
(Cross bond for rail base)

1831 COMMEMORATING AMERICAN STEEL & WIRE COMPANY 100 YEARS of PROGRESS IN WIRE MAKING 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION **And All Principal Cities**

Pacific Coast Distributors: **Columbia Steel Company, Russ Building, San Francisco** *Export Distributors:* **United States Steel Products Company, New York**



Above—Portable Casan in use testing trans-continental motor bus.
Left—Permanent installation for garage or super service station.

Ask about CASAM at the convention

Casam is a machine—and a service.

. . . A machine developed by Cities Service for the simple and accurate analysis of exhaust gases of internal combustion engines.

. . . A service offered to fleet owners by the oil marketing companies of the Cities Service organization.

The combination is Casam—a manifestation of engineering skill as applied to the petroleum industry by Cities Service.

The aim of Casam is *complete* combustion of fuel. Casam will lower your oil and gasolene consumption—will help eliminate gasolene odors—will cut maintenance costs and will tend to lengthen bus life.

Be sure to see Casam when you're at the convention—or write to us if you're not there.

• • •

CITIES SERVICE COMPANY
60 Wall Street • • • • New York

Cities Service—Casam—Cities Service—Casam—Cities Service—Casam—Citi
am—Cities Service—Casam—Cities Service—Casam—Cities Service—Casam

When you need STEEL

INSEPARABLY linked with the development of Steel is the name "Carnegie." For nearly three-quarters of a century, Carnegie Steel Company has engaged in the manufacture of Steel—experimenting, learning, serving. The knowledge accumulated during this time, and the mechanical, metallurgical and engineering resources of this company are yours to summon. A dependable source of supply plays no small part in the success of a product or of an enterprise.

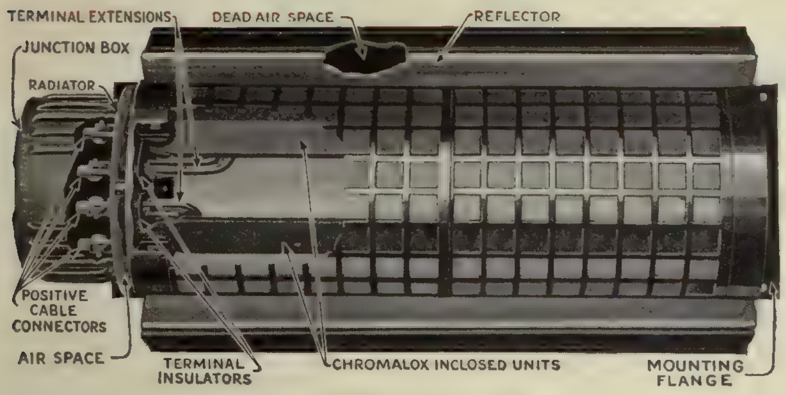
Wrought Steel Wheels
Forged Steel Axles
Standard Rails . Steel Cross Ties
Plates . Floor Plate
C B Sections . Structural Mill Products
Bar Mill Products
Stainless and Heat Resisting Steels

✣

CARNEGIE STEEL COMPANY · PITTSBURGH
Subsidiary of United States Steel Corporation

138

Two Great Advances in Car Heating Equipment



"UTILITY" Reflector TYPE Car Heater WITH Chromalox Enclosed Units

Gives Full Use of Electrical Energy Input.

Directs Maximum Amount of Heat to Lower Part of Car.

Heats the Feet and Not the Seat.

The Greatest Improvement Ever Made in Electrical Car Heaters.

"UTILITY-ARCOSTAT" Temperature Control

Regulates Within One Degree Fahrenheit of Any Predetermined Temperature.

Permanent Operating Point.

Highly Sensitive.

In Actual Service, Through Two Heating Seasons, of 1197 Arcostats Tested and Examined, Only One Out of the Entire Lot Failed to Function 100 Per Cent.

Write at once for full information

See Our Exhibit, Space E-562, American Electric Railway Convention, Atlantic City, N. J., September 26-October 2.

Railway Utility Co.

Makers of Heating and Ventilating Equipment for Electric and Steam Railway Cars, Trackless Trolleys and Buses

2241 Indiana Avenue Chicago, Illinois

For More Than 53 Years

Okonite was one of the companies that was present at the birth of A.E.R.A. fifty years ago and has faithfully served the industry ever since. Drop in at Booth 598 where a hearty welcome awaits you.

THE OKONITE COMPANY
Founded 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC.
Factories: Passaic, N. J. Paterson, N. J.
SALES OFFICES: NEW YORK CHICAGO PHILADELPHIA PITTSBURGH
ST. LOUIS ATLANTA SAN FRANCISCO LOS ANGELES DALLAS SEATTLE
Novelty Electric Co., Philadelphia, Pa. F. D. Lawrence Electric Co., Cincinnati, O.
Canadian Representatives: Engineering Materials, Limited, Montreal
Cuban Representatives: Victor G. Mendoza Co., Havana

HASKELITE *and* PLYMETL

Began a New Era in Body Design

PLYWOOD
HASKELITE
PLYMETL

Because of light weight and great structural strength Haskelite and Plymetl opened up new possibilities to engineers in bus and car design.

With Haskelite and Plymetl for roof and body panels, larger cars, trolley coaches, and motor buses were successfully produced.

The light weight of Haskelite and Plymetl helps speed up service and cuts operating costs.

The enormous strength of Haskelite and Plymetl means maximum safety from impact.

The flexibility of Haskelite and Plymetl permits attractive designs, and their inherent quality means longer body life.

Specify Haskelite and Plymetl. Our engineers will gladly cooperate with you.

SPACE C-349 AT THE CONVENTION

When it's Transportation
it's HASKELITE
and PLYMETL

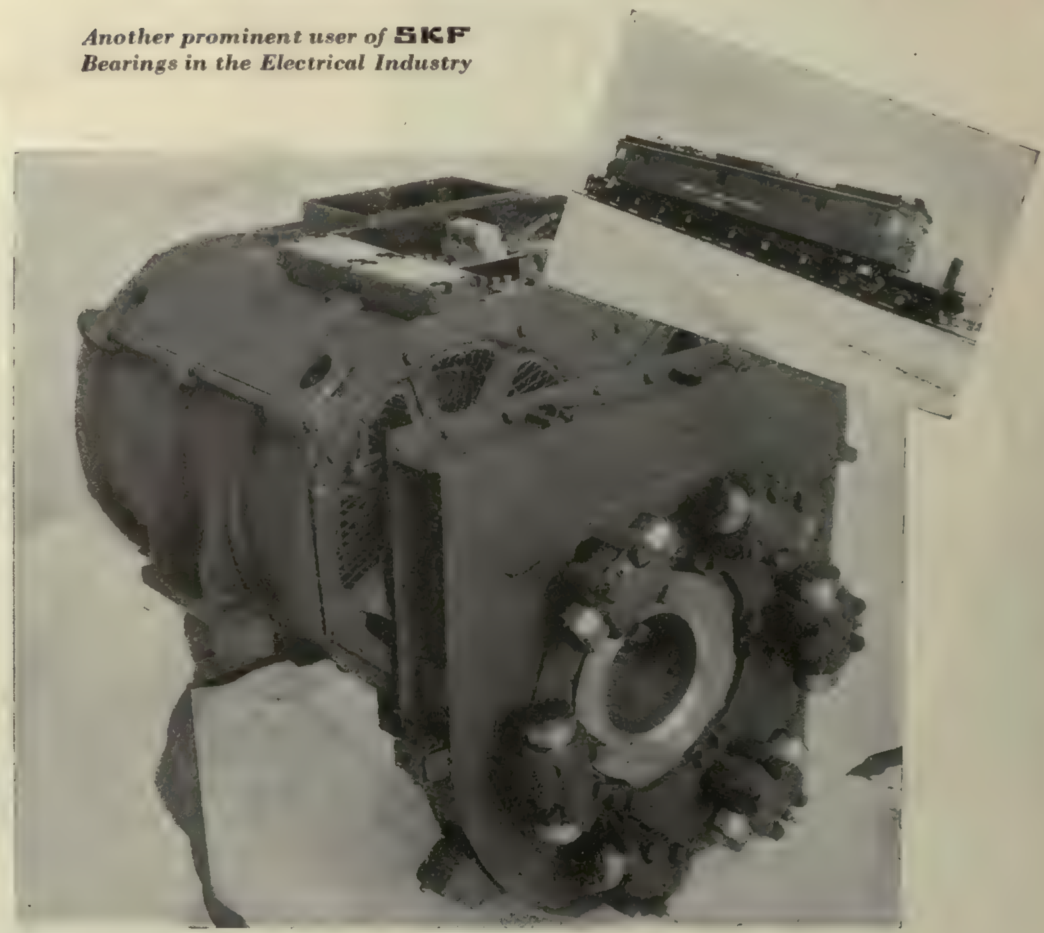
HASKELITE MANUFACTURING CORPORATION
120 South La Salle Street Chicago, Illinois

In Canada:
Railway & Power Engineering Corp., Ltd.

SELF ALIGNING BALL BEARING
DEEP GROOVE BALL BEARING
DOUBLE ROW DEEP GROOVE BALL BEARING
CYLINDRICAL ROLLER BEARING
SPHERICAL ROLLER BEARING
ALIGNING THRUST BEARING

GENERAL ELECTRIC COMPANY

Another prominent user of SKF Bearings in the Electrical Industry



60 G. E. 450 H. P. TWIN-MOTORS RELY ON SKF BEARINGS

240 SKF BEARINGS are on the motors of ten new electric locomotives for the New York, New Haven and Hartford R. R., built by the General Electric Co. Six twin-armature 450 H. P. motors on each locomotive are assured of the utmost dependability through SKF Performance. SKF Bearings are on the pinion and commutator ends of each armature.

Rigid requirements of exacting schedules, elimination of delays and low cost operation are materially aided by SKF Bearings. Sealed housings retain lubricant, stop leakage on windings and reduce maintenance. All these factors assure maximum performance and zealously guard initial motor efficiency.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2751

SKF

More . Performance

Features of
New 5-A ENGINE

●

- Overhead Valves
- 4⅝" bore, 5¾" stroke. Piston displacement 580 cubic inches.
- 18% increase in torque.
- Counterweighted 7 bearing crankshaft, alloy steel heat treated with cast iron crankcase of exceptional rigidity.
- 100% oil filtering system.
- Dual ignition, electrically synchronized with all ignition wires running from a single distributor head.
- Special designed cylinder head with inserted exhaust valve seats.
- Provision is made for tachometer drive.
- Quick accessibility to all major parts.

WHITE Coaches have become the first choice of the country's leading operators because they unfailingly deliver more performance with greater economy.

More performance in the form of higher operating efficiency, faster schedules and increased flexibility for city traffic or higher average speeds for inter-city service.

Greater economy in the form of lowest cost per coach mile.

For special types of service requiring increased power for higher average speeds and greater acceleration, White has developed the new 5-A Engine for Models 54 and 54-A.

Following the highly successful series of White engines the new 5-A Engine is a big step forward — an important contribution to increased operating performance.

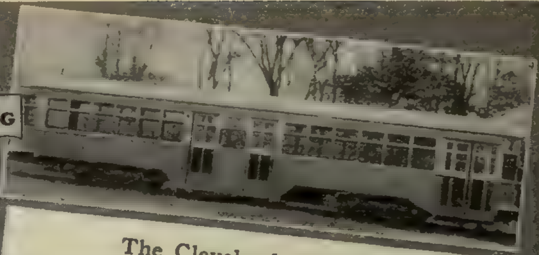
The complete line of six cylinder White Coaches ranges from 16 to 41 passengers, offering a proper unit for every type of operation. The ability to maintain on-time schedules plus greater riding comfort assures greater passenger revenue and more profits for the operator. The White Company, Cleveland.

WHITE
COACHES

See the White Coach and Truck Exhibit in Space C-311 A. E. R. A. Convention

Lima Light, Power and Tramways Co.

TIMKEN *Tapered Roller* BEARING EQUIPPED



The Cleveland Railways.

Steubenville, East Liverpool and Beaver Valley Traction Company.

Pittsburgh Railways.

Milwaukee Electric Railway and Light Company.

Chicago & Milwaukee Electric Railway Co.

Market Street Railways, San Francisco.

Georgia Power Company.

Many electric railway companies are operating Timken Bearing Equipped cars for faster acceleration, higher speeds, smoother running and greater riding comfort. They have found this a sure way to hold and increase patronage, and to reduce operating and maintenance costs at the same time. You need Timken Bearing Equipped cars on your lines to meet modern conditions.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**

Now . . .

the Fargo Coach line is exceptionally complete!

with the introduction of . . .

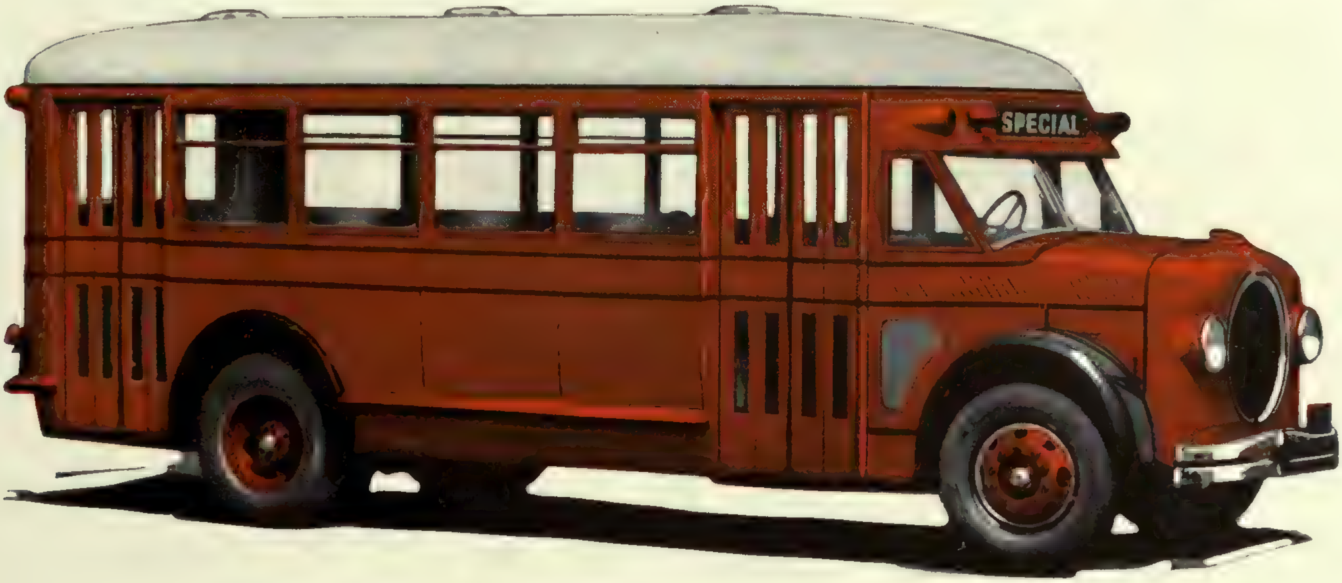
The new 29-passenger Parlor Coach with reclining seats and all-metal body—weighing complete less than 13,000 pounds . . . And the 33-passenger circulating-load type Street Car of like construction . . . Both many thousands of pounds lighter than vehicles of comparable capacity, and setting startling standards of performance. Replace dead-weight with paying passengers and benefit doubly—through lowered operating expense and added revenue from the additional passengers carried.

Parlor Coach, with reclining seats, has a capacity of 29 passengers—35 with auxiliary aisle seats; with non-reclining seats, a capacity of 33—with auxiliary seats 40. Overall length of coach is 30 feet.

Street Car seats 33 passengers and has aisle and loading well space for an unusually large number of standees. Circulating-load features assure rapid handling of passengers.

▲ ▲ ▲ *and*

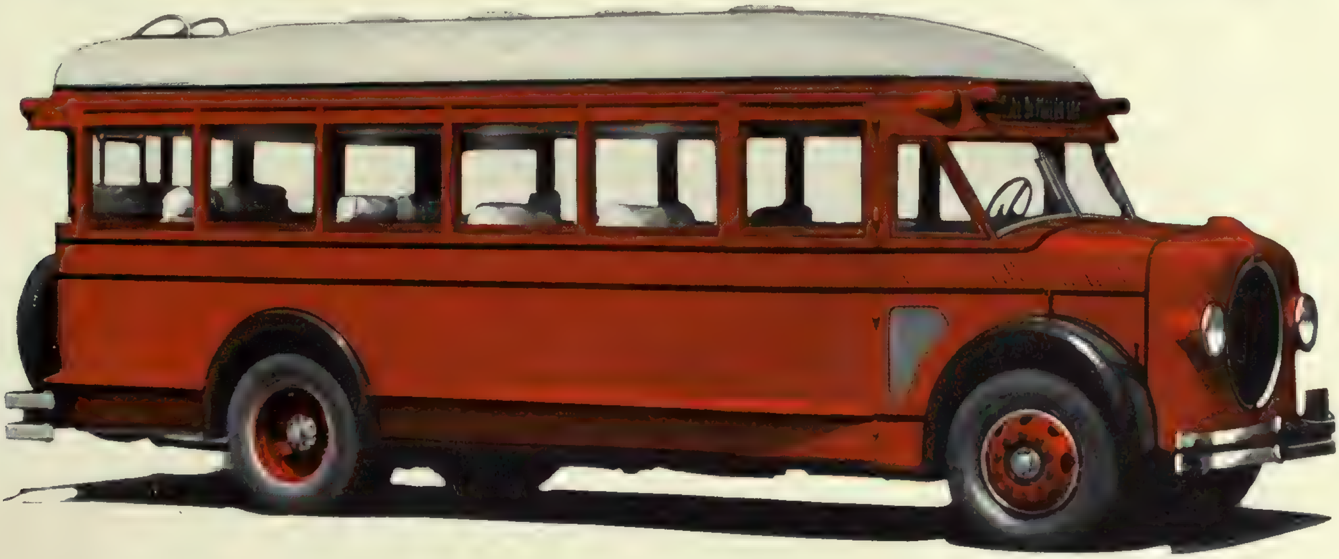
Fargo 21-passenger Street Car



Seats for 21 passengers . . . Two large loading wells and 22-inch aisle (measured at seat cushions) accommodate upwards of 40 standees in comfort . . . Front entrance and rear exit doors—each 24 inches in clear—for rapid passenger circulation.

▲ ▲ ▲ *and*

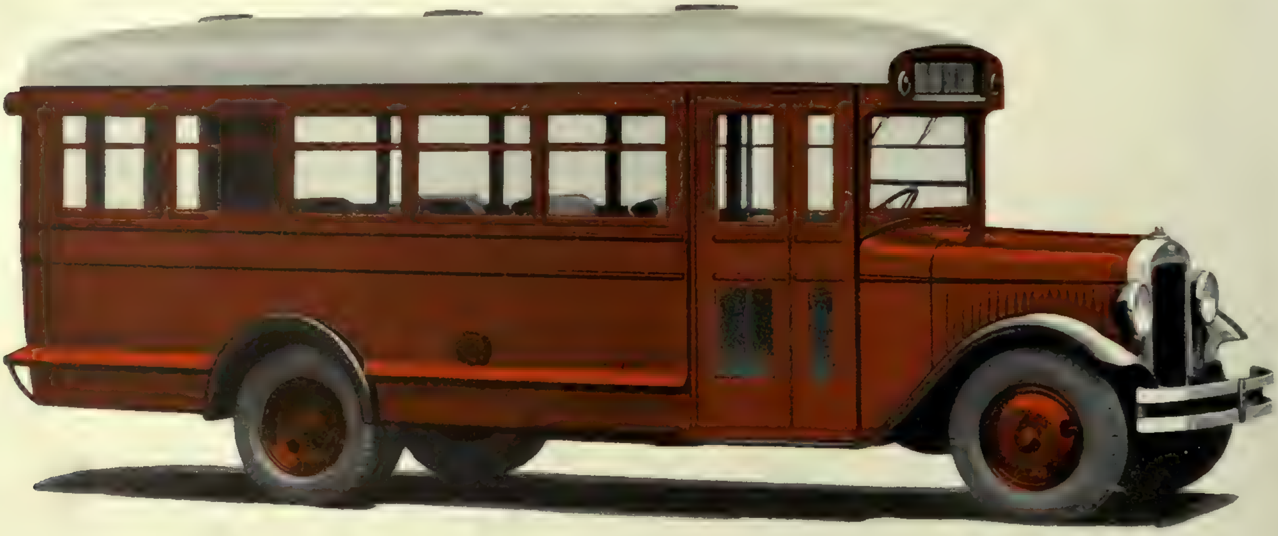
Fargo 21-passenger Parlor Coach



Seats for 21-25 passengers. All, except auxiliary and rear section, are reclining type with 3-position adjustment . . . Interior baggage lofts are commodious and sturdy. Interior appointments finished in a distinctive modern motif.

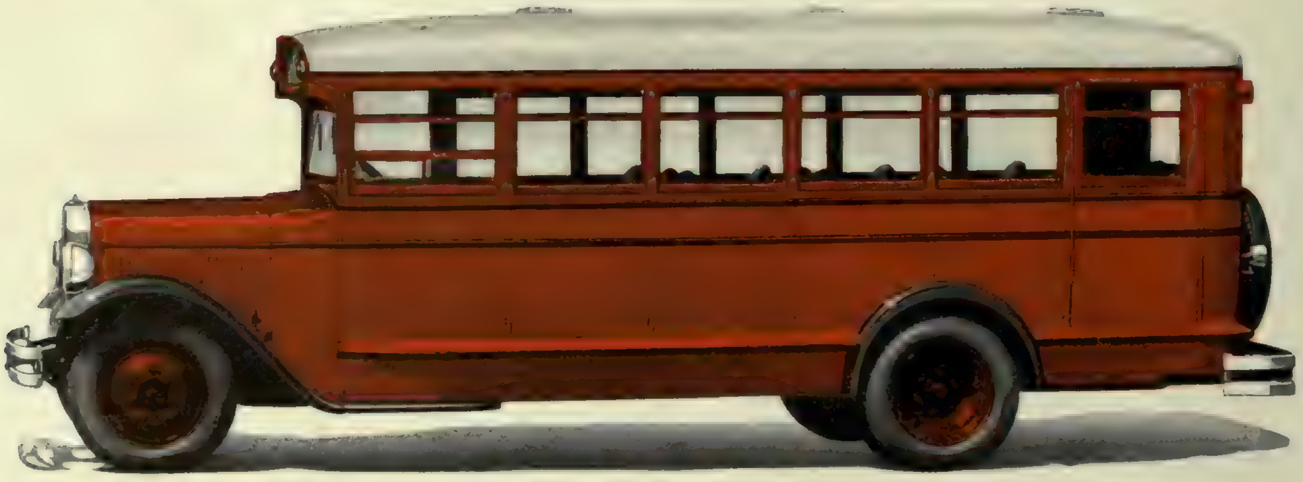
and Fargo Sixes ▲ ▲ ▲

21-passenger Street Car



Seats for 21 passengers; conventional design throughout, with 6-cylinder 96-horsepower engine, full-floating rear axle, 10-inch double-drop frame, 4-speed transmission, weatherproof internal hydraulic brakes and many other modern features.

16-passenger Parlor Car



Seats for 16 passengers. Entrance door of one-piece type. Comfortable seats of the chair type. Attractive interior. 6-cylinder 96-horsepower engine and other features found in the Street Car shown above.

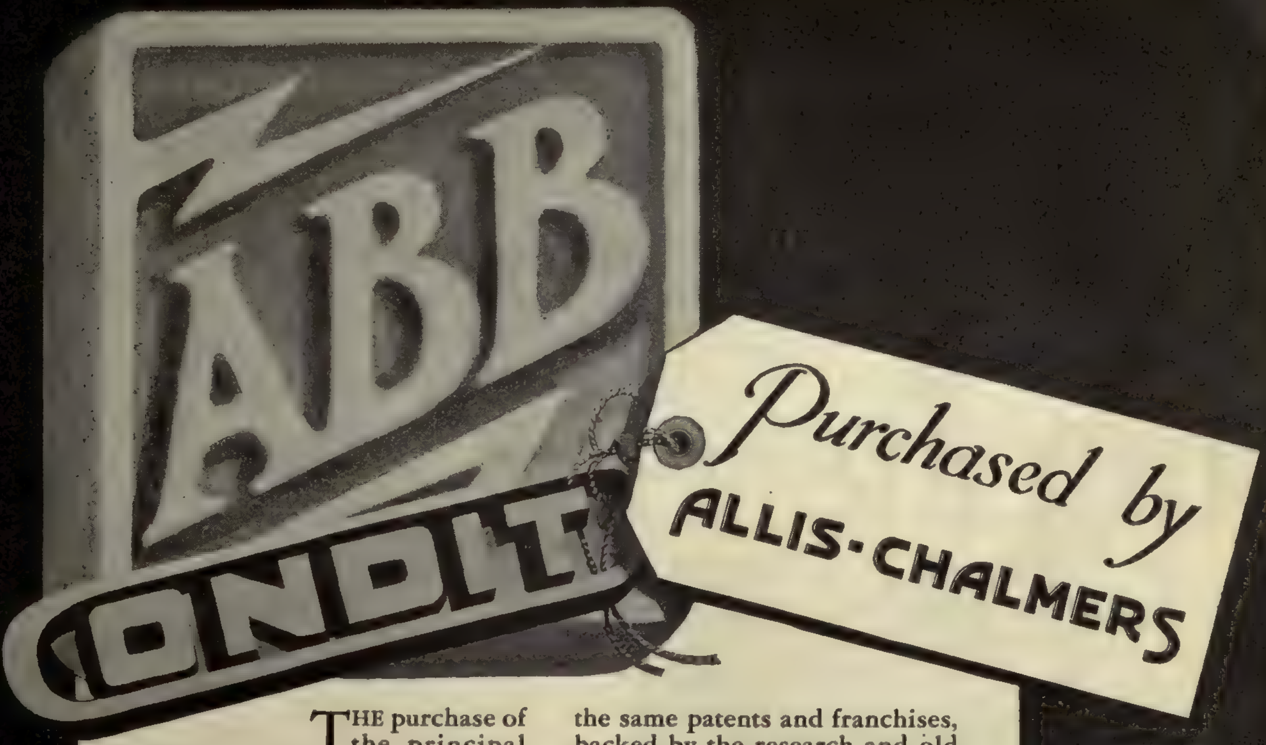
FOR COMPLETE INFORMATION WRITE TO

FARGO MOTOR CORPORATION

DETROIT, MICHIGAN

DIVISION OF CHRYSLER CORPORATION

E-1151 PRINTED IN U.S.A.



THE purchase of the principal assets of American Brown Boveri Co., Inc., by Allis-Chalmers Manufacturing Company, is now complete. This is the last time the "A.B.B." trademark will appear, for the name "American Brown Boveri" will be discontinued.

But it is not the intention of Allis-Chalmers to submerge the identity of American Brown Boveri equipment. The principal lines of electrical apparatus, railway, and blower equipment will continue to be manufactured with the same distinctive characteristics.

The key men of American Brown Boveri are now with Allis-Chalmers. They bring with them their engineering skill, their vast experience, their outstanding craftsmanship, and their record of brilliant achievement.

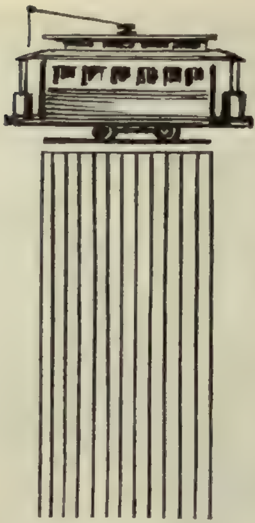
They are free to work under the same patents and franchises, backed by the research and old world experience of Brown Boveri & Co., Ltd., of Baden, Switzerland. They are supported by Allis-Chalmers resources and facilities. They will continue to build American Brown Boveri equipment under the name of Allis-Chalmers.

The capital stock of Condit Electrical Manufacturing Corporation has also been purchased; but this company will manufacture its splendid oil switches, circuit breakers, and other equipment as a separate subsidiary company, with its own selling organization.

The acquisition of these new lines will round out the Allis-Chalmers service to the electrical industry; so that Allis-Chalmers can now offer practically every major form of power or electrical equipment.

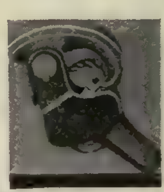
ALLIS-CHALMERS

THE STORY OF SLIDING CONTACT GOES BACK TO THE BEGINNING OF THE . . . . . . ELECTRIC . . . . . RAILWAY . . . . .



Describing one of the earliest electric railway installations in the United States, the Street Railway Journal of January, 1890, says . . . "The sliding contact trolley affords a much more extended surface for the passage of current than the periphery of a wheel and while it adheres securely to the trolley wire, the most accurate measurements fail to reveal any wear on the wire."

MILLER TROLLEY▲▲▲ SHOES



the modern fulfillment of first principles ▲ ▲ ▲ ▲

The principles and advantages of sliding contact are just as sound today as they were in 1890. Even the electrified steam railroads recognize these advantages and use the pantagraph collector—a modified form of trolley shoe.

For over 15 years, the Miller Trolley Shoe has been the leading equipment adapting these principles to street car and high speed interurban service. These shoes have been adopted and are standard equipment on various well-known properties such as the Northern Texas Traction Company (illustrated at left) and many others.

Better contact for heavy current drafts . . . freedom from arcing and pitting of wire . . . ability to cling to wire at high speed and sharp angles . . . No lubrication required . . . lower costs all around . . . these are but a few of the advantages found by users of Miller Trolley Shoes.

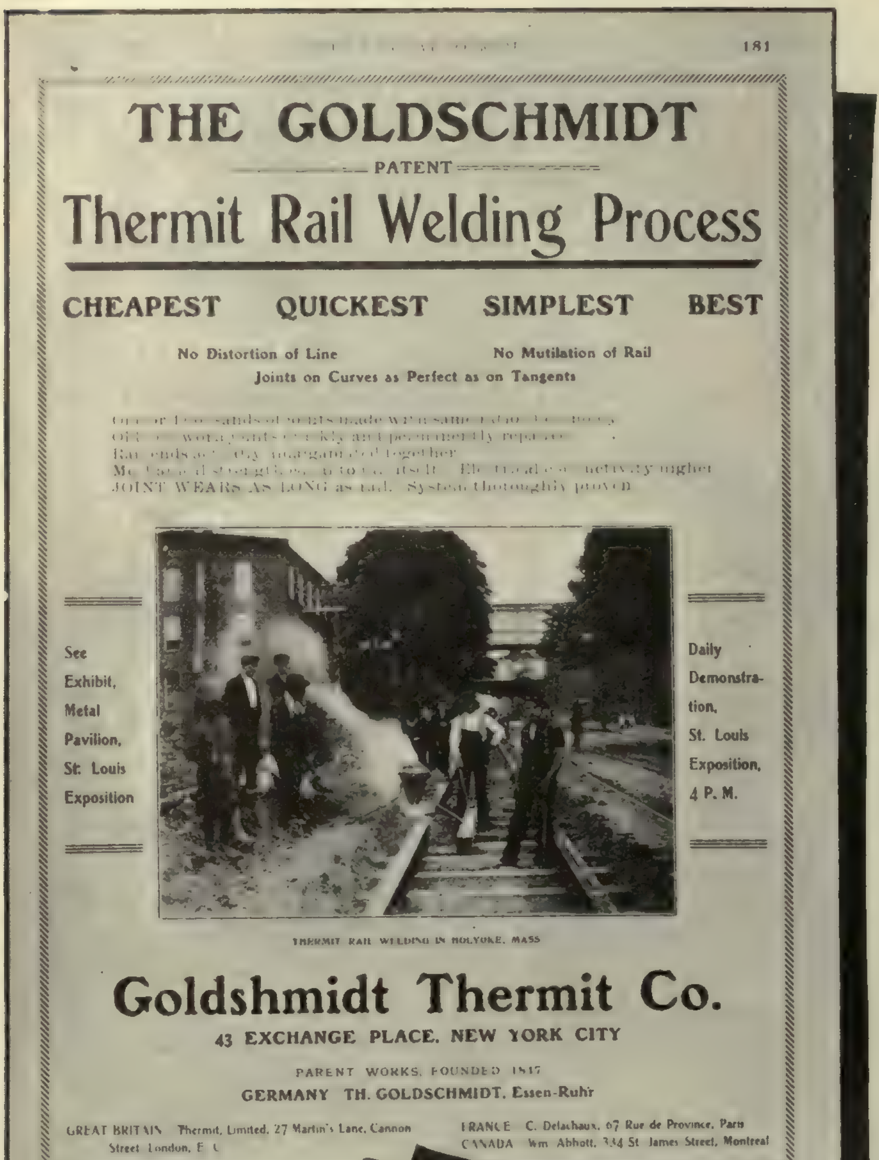
Write for further information and quotations.

MILLER TROLLEY SHOE COMPANY
77 Floydell St.
Boston 30, Massachusetts

Altogether— NOW!

MEMBERS OF THE A.E.R.A.! . . . . . For fifty years your great Association has been pulling together, always striving for the improvement and betterment of the electric railway industry. Through many of these years the Metal & Thermit Corporation has been associated with you as a manufacturer member. We are proud of this association and are pleased to pledge you our continued support and encouragement in every undertaking for the good of the industry. Now, on your Fiftieth Anniversary, there is greater need than ever before, for courage, and for teamwork. Let's go . . . altogether—*now!*

The first Thermit advertisement appeared July 2,1904



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THE GOLDSCHMIDT

PATENT

Thermit Rail Welding Process

CHEAPEST QUICKEST SIMPLEST BEST

No Distortion of Line No Mutilation of Rail

Joints on Curves as Perfect as on Tangents

See Exhibit, Metal Pavilion, St. Louis Exposition

Daily Demonstration, St. Louis Exposition, 4 P. M.

THERMIT RAIL WELDING IN HOLYOKE, MASS

Goldshmidt Thermit Co.

43 EXCHANGE PLACE, NEW YORK CITY

PARENT WORKS, FOUNDED 1847

GERMANY TH. GOLDSCHMIDT, Essen-Ruhr

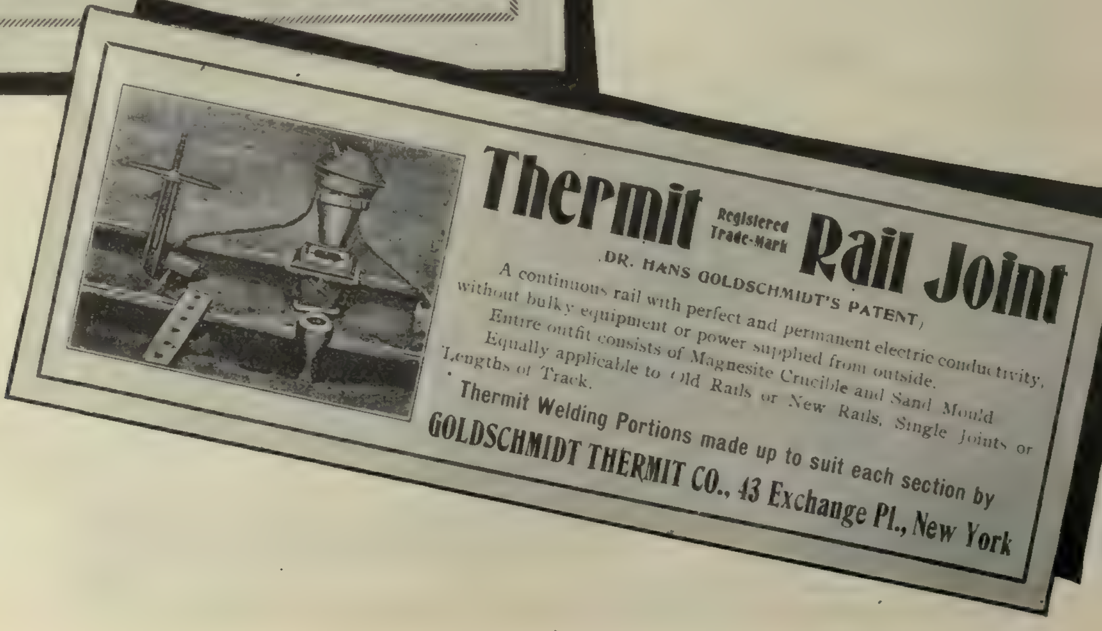
GREAT BRITAIN Thermit, Limited, 27 Martin's Lane, Cannon Street London, E. C.

FRANCE C. Delachaux, 67 Rue de Province, Paris

CANADA Wm Abbott, 334 St. James Street, Montreal

IN THE beginning it was only the modest quarter-page shown below. But shortly afterward the more impressive display shown at the left was published. This was at the time when the American Electric Railway Association held its convention at the St. Louis World's Fair, in the Fall of 1904.

Read the points which they stressed in those first advertisements twenty-seven years ago. Thermit and its advantages are substantially the same today as they were then.



Thermit Registered Trade-Mark Rail Joint

(DR. HANS GOLDSCHMIDT'S PATENT)

A continuous rail with perfect and permanent electric conductivity, without bulky equipment or power supplied from outside.

Entire outfit consists of Magnesite Crucible and Sand Mould

Equally applicable to Old Rails or New Rails, Single Joints or Lengths of Track.

Thermit Welding Portions made up to suit each section by

GOLDSCHMIDT THERMIT CO., 43 Exchange Pl., New York

THERMIT

THE process of Thermit Welding was first introduced into the United States by Dr. Hans Goldschmidt in 1903, and the first rail welding advertising was done the following year. Later on, the Goldschmidt Thermit Company was taken over by the Metal & Thermit Corporation, an organization of American business men and American capital.

The Metal & Thermit Corporation is, therefore, one of the pioneer companies in America engaged in welding operations. It is an established institution, possessing a history of many years association not only with the electric railways, but also with several other branches of industry. It is a corporation with ample financial ability to carry out its contracts and to perform the research and development work necessary to keep its product and processes thoroughly up to the most modern requirements.

Although Thermit is the same basic material, and involves essentially the same methods as when it was first introduced, the Metal & Thermit Corporation has been able to improve and refine the process, so that now it can be done at less than half the cost which prevailed even ten years ago.

Cost is no longer a factor in comparing Thermit Welding with other methods. Thermit Welding costs are now distinctly "in line" and Thermit's other manifest advantages of permanence, and freedom from maintenance requirements, have made it the standard rail welding practice on scores of leading properties. Since the Coffin Award was established some years ago, six out of the eight winning roads have been users of Thermit.

There can be no satisfactory substitute for experience. The engineers of the Metal & Thermit Corporation are experienced track men. They have supervised and assisted in the installation of thousands of welds on hundreds of different roads. They have helped to solve the many troublesome "local condition" problems that always arise. They have learned why even the best of welds sometimes fail—and they know what to do to keep such failures to a minimum. They have now overcome one of the last arguments against this process—that of possible interruption to traffic on lines whose headway is close. "Thermit-Welding-Under-Traffic" (described on the following page)—is their answer.

TODAY—in Steel Mills.

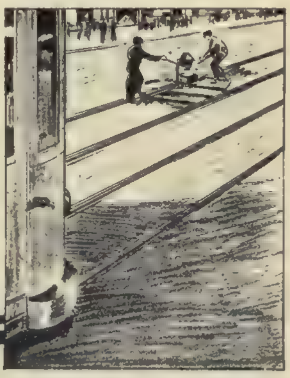
The general acceptance of Thermit for heavy welding in steel plants is evidence of the *quality* of steel produced by the Thermit reaction. Broken parts are welded and worn parts built up by the Thermit process.

TODAY — in Marine Repairs.

Lloyd's Registry and the American Bureau of Shipping approve Thermit Welding for certain classes of repair work such as broken stern frames and rudder parts. It saves drydock time and cuts repair costs.

TODAY—in Locomotive Shops.

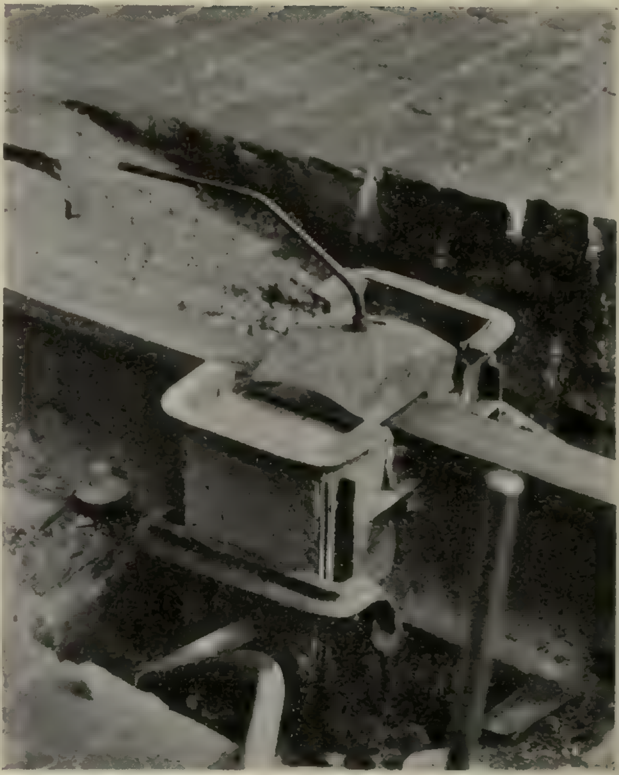
Most of the big American railroads have been using Thermit-welding equipment in their shops for many years. It is used for repairing broken locomotive frames and also for making heavy castings.



TODAY—in Track Welding.

The familiar Thermit crucible is seen more and more wherever track gangs are at work. Even the steam railroads are experimenting with this process on main line track, for special work, and elsewhere.

THERMIT WELDING under traffic



Removable heating cover in place during preheating

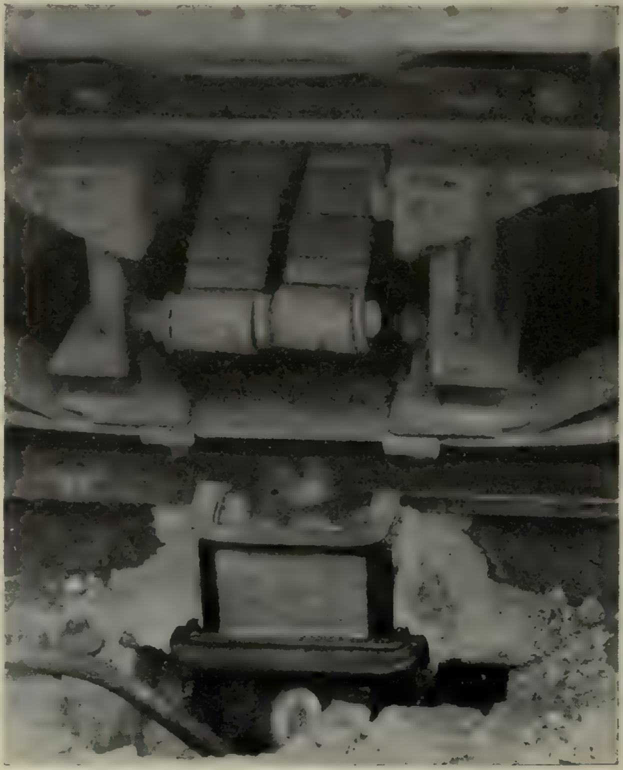
First tried-out in 1928 on the Third Avenue Railway Lines, this method has been perfected by our engineers through almost continuous experimental installations on the tracks of several other companies where different conditions had to be met and overcome. Thousands of joints were welded during the course of these developments.

The process was offered for general use through our public announcement several months ago. Already a large number of roads have taken it up.

Thermit-Welding-under-traffic, as accomplished by this process, requires no bridges, no side-tracks, no other special equipment for taking the cars off the rail. The cars continue in operation all during the process of welding. "Three-minutes" has been established as the average time required to keep the cars off the joint, just when the weld is being "poured." The top section of the mold is then removed, and the cars proceed in the regular way. By a new mold design and a patented method of holding the rail ends, the cars are enabled to run directly on the rail during the entire process except for that three minutes of actual welding time. The process itself is just as easy and just as simple as the standard method of Thermit Rail Welding.

While this process of rail-welding-under-traffic is covered by patents and patent applications, it is available to users of Thermit without additional charge.

Ask any Metal & Thermit representative, or see us at the Convention, for full details, illustrations and estimates on this or any other phase of Thermit Welding.

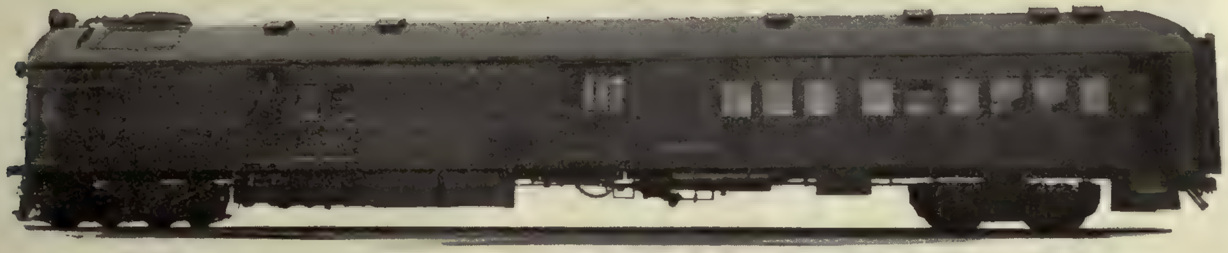


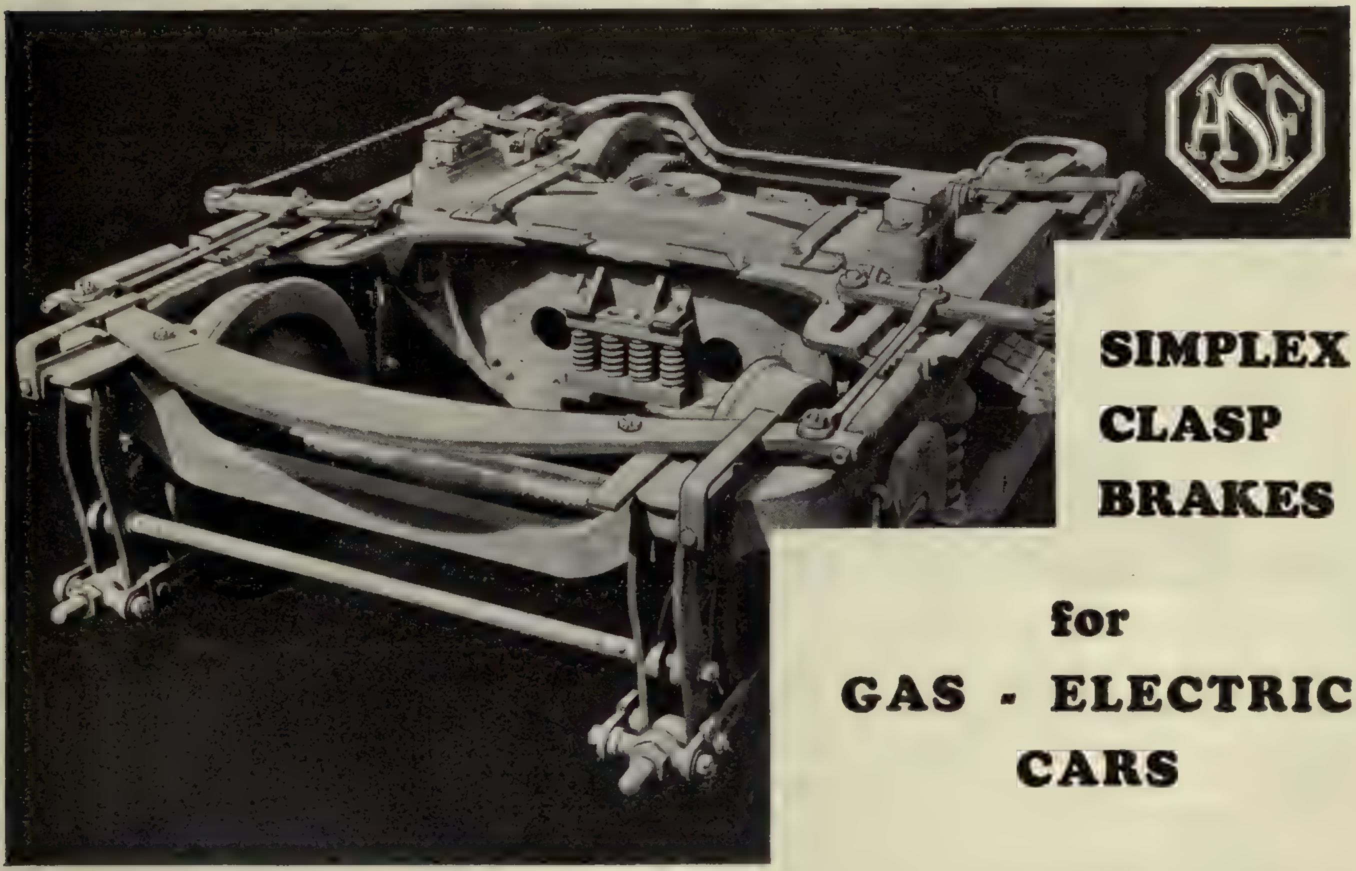
Car operating over joint during preheating

The METAL & THERMIT CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto





SIMPLEX CLASP BRAKES

for GAS - ELECTRIC CARS

RAILROADS of the country are using American Steel Foundries Clasp Brakes for passenger equipment.

Greater retardation; reduction in brake shoe wear; desirable balancing of braking forces—all have proved the value of Clasp Brakes.

Gas-electric cars have increased in weight and size until they now are frequently larger than standard passenger cars. For these reasons, they, too, need Simplex Clasp Brakes. Clasp Brakes are applicable to Gas-Electric Car Trucks and should be included in your specifications.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Put your track equipment needs up to Bethlehem

Special car barn layout assembled before shipment in one of Bethlehem's spacious shops.

Bethlehem Silico-Manganese Crossing at 12th and Market Sts., Philadelphia, Pa.

Bethlehem No. 3-A Steel Ties used in double-track construction in a large mid-western city.

BETHLEHEM is prepared to meet the requirements of your construction program with safe, dependable track equipment. Many installations in widely separated sections of the country have demonstrated the reliability, low maintenance cost and satisfactory performance of Bethlehem Track Equipment.

■ BETHLEHEM SILICO-MANGANESE TRACKWORK.

This new trackwork is finding increasingly wide application for all locations including those where traffic conditions are unusually heavy. The Silico-Manganese intersection castings are Thermit-Welded to the rails making a solid, one-piece construction and eliminating the use of cast iron or bolts. The castings are heat-treated to harden them and increase their wearing qualities. This heat treatment gives Silico-Manganese Trackwork great resistance to initial pounding and wear. It has unusually long life and when worn is easily built up in the field by any of the standard methods of welding.

Temporary track construction with Bethlehem No. 3-A Steel Ties equipped with special base plates.

This Bethlehem "Grand Union" has been installed over 10 years at an important traffic intersection in an eastern city.

■ BETHLEHEM SPECIAL TRACKWORK.

In the fabrication of special layouts, grand unions and car barn layouts, Bethlehem has introduced many improvements that assure easy assembly and correct fit of each piece in the field. Time and labor required for installation have been reduced, leading to substantial savings, especially where construction must proceed under traffic.

■ BETHLEHEM STEEL TIES.

Steel Ties for concrete construction are made in a variety of sizes to meet the wide range of conditions and practices in the electric railway industry. These steel ties save time, excavation, concrete and labor in installation. Bethlehem now manufactures a special tie for laying temporary track on top of the paving, greatly speeding up construction work.

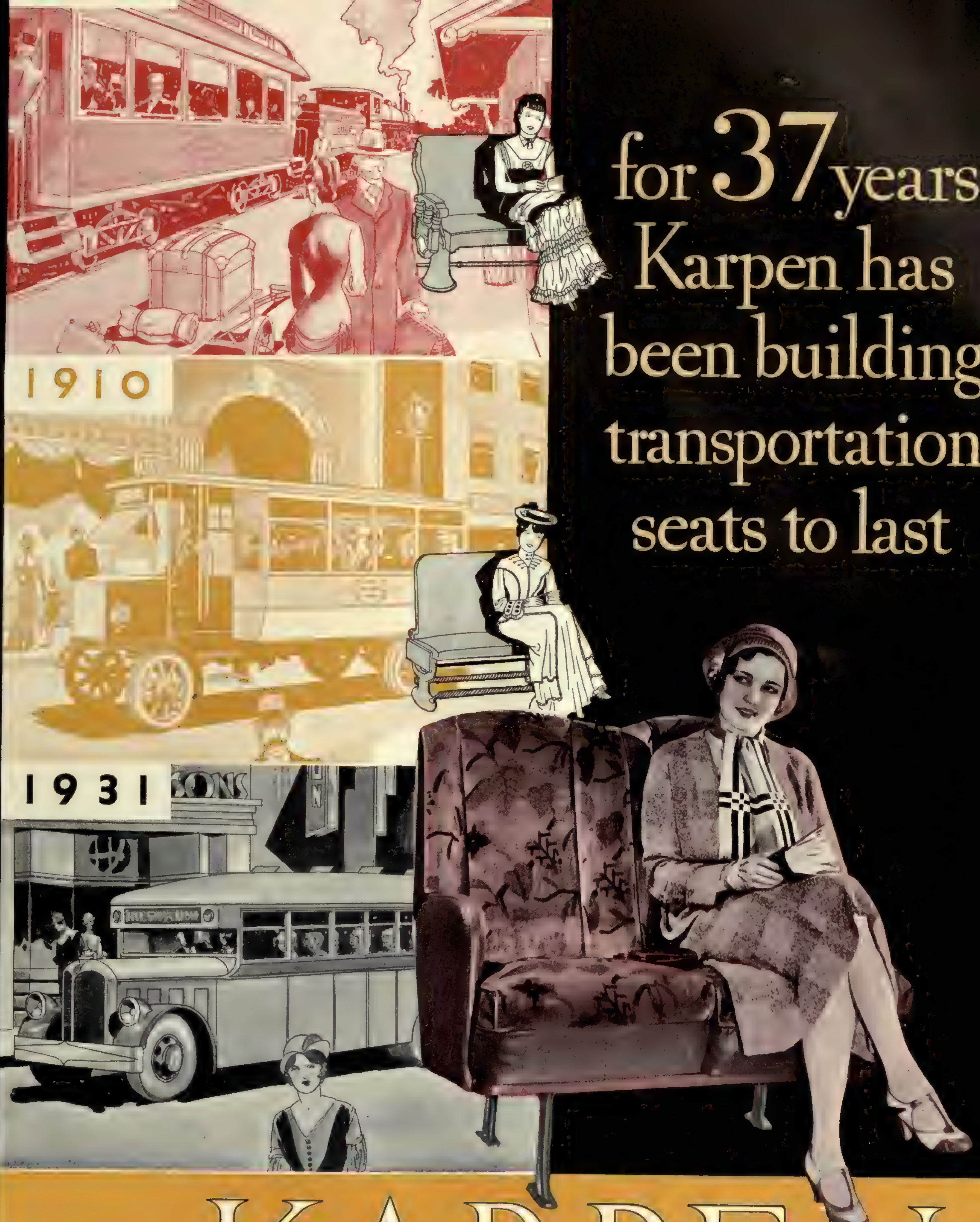
BETHLEHEM STEEL COMPANY
General Offices:
Bethlehem, Pa.

District Offices. New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.

Pacific Coast Distributor. Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor. Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM



for 37 years Karpen has been building transportation seats to last

KARPEN

It's the Seating that Counts

A Seat for every Transportation need

EACH transportation company has its individual seating problems. The average length of ride, the speed of travel, the character of riders . . . whether shoppers, workmen, children, tourists . . . the question of standees, the nature of the competitive transportation, the limitations of chassis and body design . . . all have a bearing on the choice of the seating. Whatever the selection, three qualities are always demanded . . . good looks, comfort, and long life, to give low cost per seat mile. Karpen makes a seat for every transportation need . . . bus, interurban, street car, railway, trolley bus. You can concentrate your purchases here and be assured of satisfaction. Thirty-seven years of good seat building proves it.

S. KARPEN & BROS.
Transportation Seating Dept., Chicago
New York Michigan City, Ind. Los Angeles

KARPEN
Guaranteed
FURNITURE

No. 318

No. 17

No. 10

No. 100

KARPEN

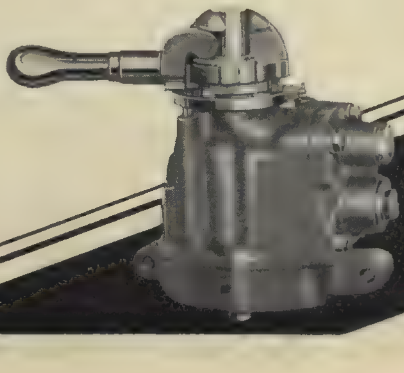
It's the Seating that Counts

The SAFETY CAR . . .
CONTROL EQUIPMENT

—on Display
at the A.E.R.A. Convention

WE invite you to visit our exhibit at Atlantic City (space E-570) and let one of our representatives demonstrate to you the lastest improvements that help to speed transportation SAFELY — including the NEW Self-Lapping Brake Valve.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



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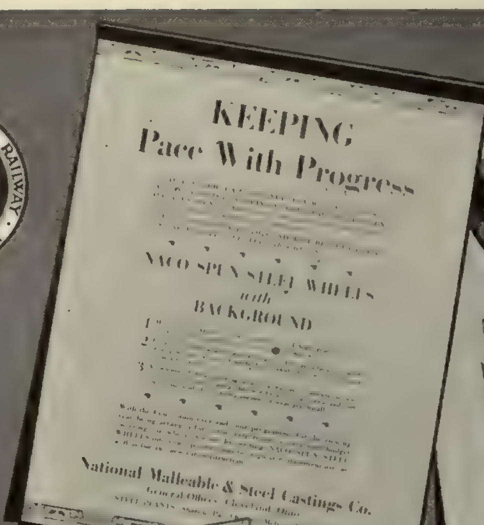
MEMBER
AMERICAN ELECTRIC RAILWAY ASSOCIATION
AERA



KEEPING
Pace With Progress

NACO SPUN STEEL WHEELS
with
BACKGROUND

National Malleable & Steel Castings Co.
General Offices Cleveland, Ohio

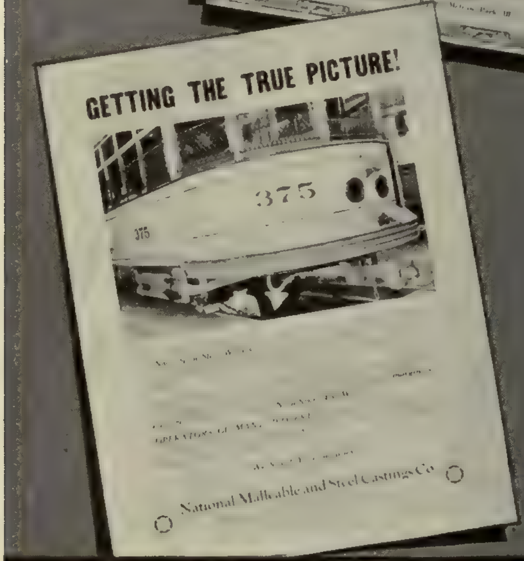
NACO SPUN STEEL WHEELS

A PROFITABLE SUMMARY...

Uniform Performance in Service
Lower Average Wheel Costs
Better and More Effective Car Maintenance
All Factors Leading To Economical Operation

When Using

THE ULTIMATE WHEEL



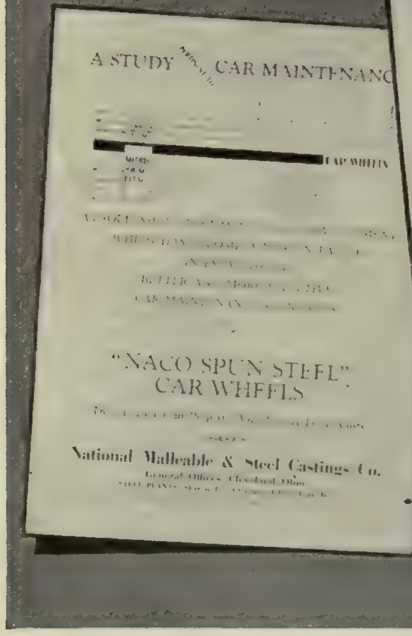
GETTING THE TRUE PICTURE!

National Malleable and Steel Castings Co.

A "CHECK-UP" AFTER 5 YEAR

THE GREATLY INCREASED USE OF NACO SPUN STEEL CAR WHEELS IS INDICATIVE OF THEIR DEFINITE **UTILITY** FOR THE INDUSTRY.

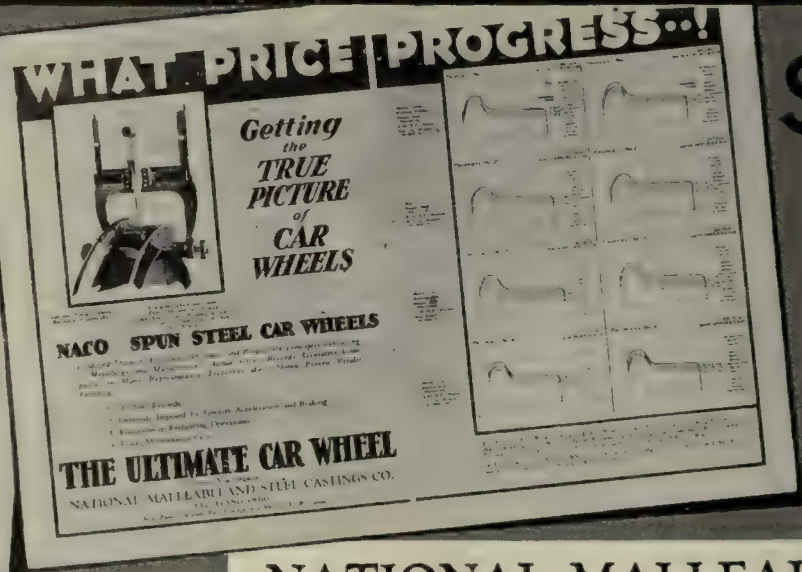
NACO - THE ULTIM



A STUDY ... CAR MAINTENANC

"NACO SPUN STEEL" CAR WHEELS

National Malleable & Steel Castings Co.



WHAT PRICE PROGRESS..!

Getting the TRUE PICTURE of CAR WHEELS

NACO SPUN STEEL CAR WHEELS

THE ULTIMATE CAR WHEEL

NATIONAL MALLEABLE AND STEEL CASTINGS CO.

SPUN

NATIONAL MALLEABLE ANI

CLEVELANI

Steel Plants: Sharon, Pa., Chicag

A PROFITABLE SUMMARY for The ELECTRIC RAILWAY.. INDUSTRY..

NACO SPUN STEEL WHEELS

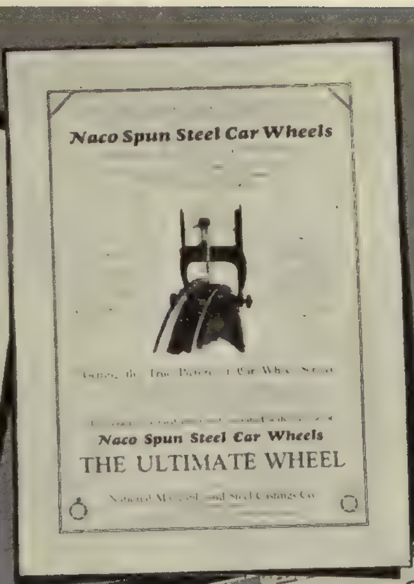
During the Past Year the Industry Has Continually Pronounced That There Is A Steadily Increasing Requirement

A BETTER CAR WHEEL

A DEFINITE INDICATION

THE ULTIMATE CAR WHEEL...

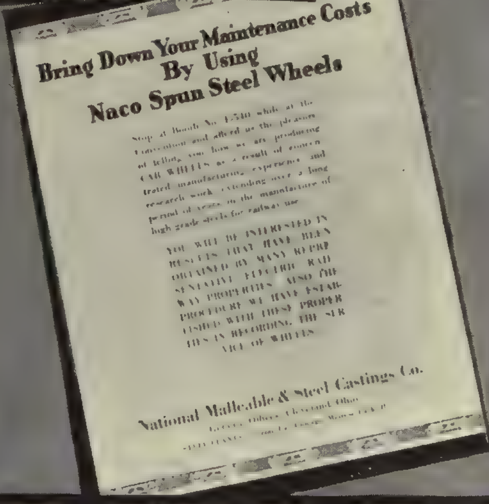
NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY



Naco Spun Steel Car Wheels

Naco Spun Steel Car Wheels

THE ULTIMATE WHEEL



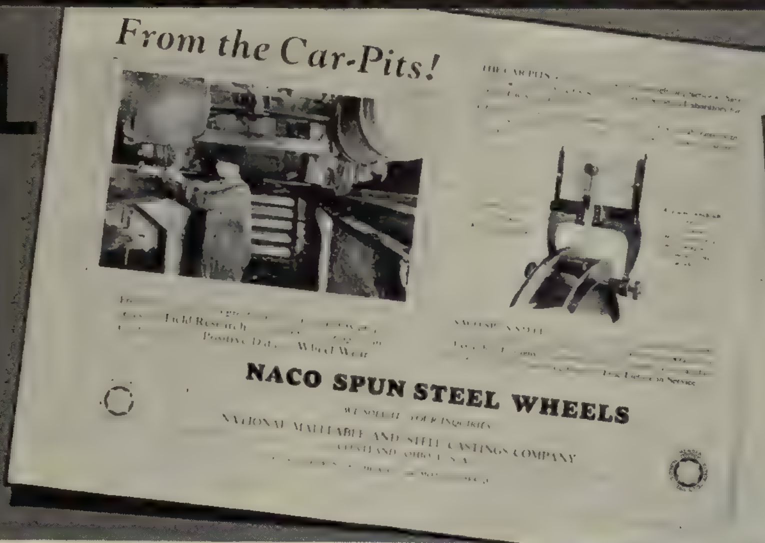
Bring Down Your Maintenance Costs By Using Naco Spun Steel Wheels

National Malleable & Steel Castings Co.

THE MANY VITAL FACTORS INVOLVED IN SUCCESSFUL ELECTRIC RAILWAY OPERATION TODAY USUALLY IMPOSE INCREASED DEMANDS ON EQUIPMENT—WHEN CONSIDERING **CAR WHEELS** THIS CONDITION CAN BE MET MOST ECONOMICALLY BY SPECIFYING:—

ATE WHEEL - NACO

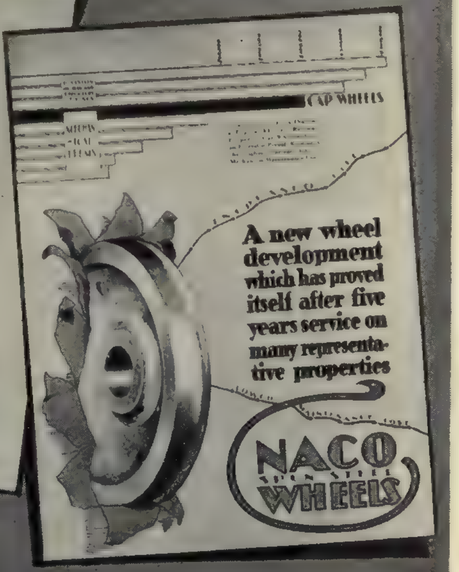
STEEL



From the Car-Pits!

NACO SPUN STEEL WHEELS

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY



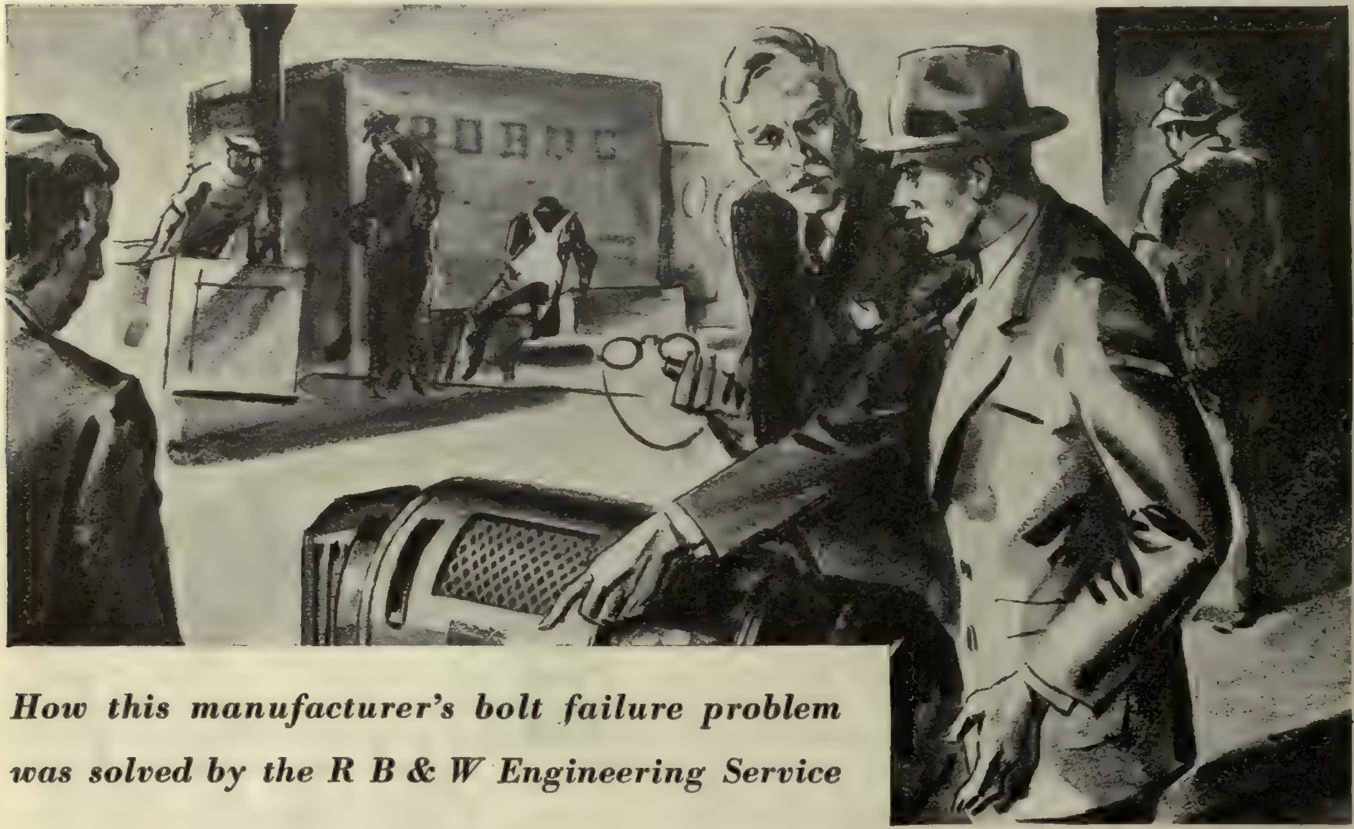
CAR WHEELS

A new wheel development which has proved itself after five years service on many representative properties

NACO SPUN STEEL WHEELS

STEEL CASTINGS COMPANY
OHIO, U. S. A.
nd Melrose Park, Ill.

HE FORGOT...
TO FIGURE INITIAL STRESS



How this manufacturer's bolt failure problem was solved by the R B & W Engineering Service

"Bolts still failing. Rush new shipment. Must have higher tensile strength." Thus wired a customer. And then the R B & W Engineering Service got busy.

The customer was a builder of a portable electric machine used in construction work. He was using bolts to attach the heavy machine assembly to the frame of a trailer truck. We had tested specimens of his bolts before shipment and they had shown 86,000 pounds, so the next thing to do was to make an on-the-spot investigation.

We discovered that the customer, when estimating the strength of the bolts he needed, had forgotten to allow for the initial stress placed on the bolts when his machine was assembled. The bolting together of the parts exerted a stress, which, when increased by service loads, exceeded the capacity of his bolts. A slight increase in diameter of the bolts eliminated his trouble.

The skilled engineer, and the layman as well, can utilize the specialized knowledge of bolting material available without obligation through the R B & W Engineering Service. Send us your problems.

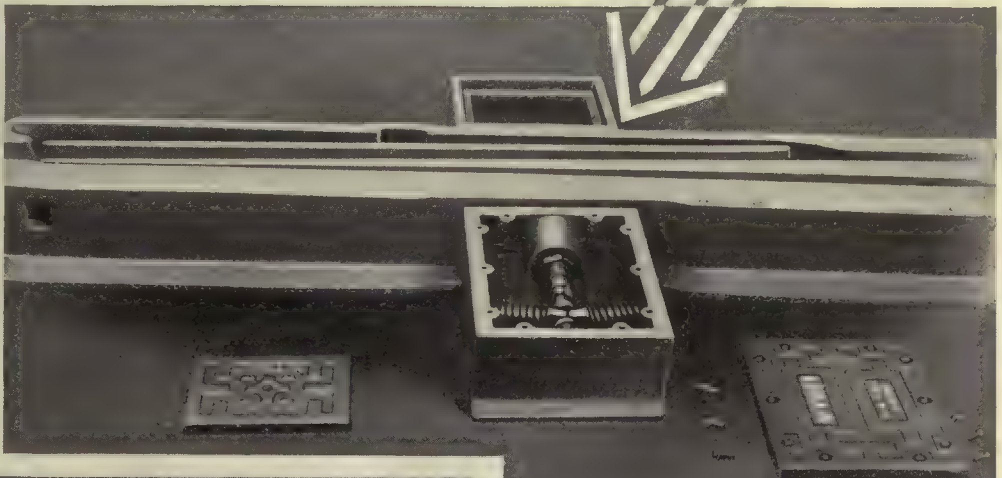
RUSSELL, BURDSALL & WARD BOLT & NUT CO.

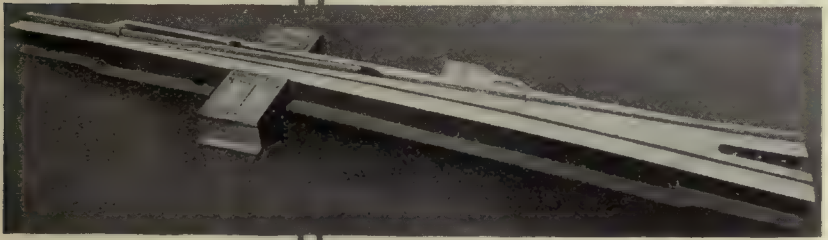
ROCK FALLS, ILL. PORT CHESTER, N. Y. CORAOPOLIS, PA.
Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

Here is protection for

Tongue Mechanism~

LEHECKA WATER-TIGHT TONGUE HOLDING DEVICE





In Lorain Exhibit
Spaces
D-432-433-434-435
A.E.R.A. Convention
Atlantic City

ANOTHER development of LORAIN is this device which can be set to hold the tongue securely in either position or for spring switch movement. The water-tight box in which the mechanism works is kept full of oil, an important feature as it reduces the wear on mechanism parts which are kept lubricated. Foreign matter, such as sand, dust, etc., is also excluded. Drainage of the switch-bed is provided for by the small box on the opposite side.

THE LORAIN STEEL COMPANY

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

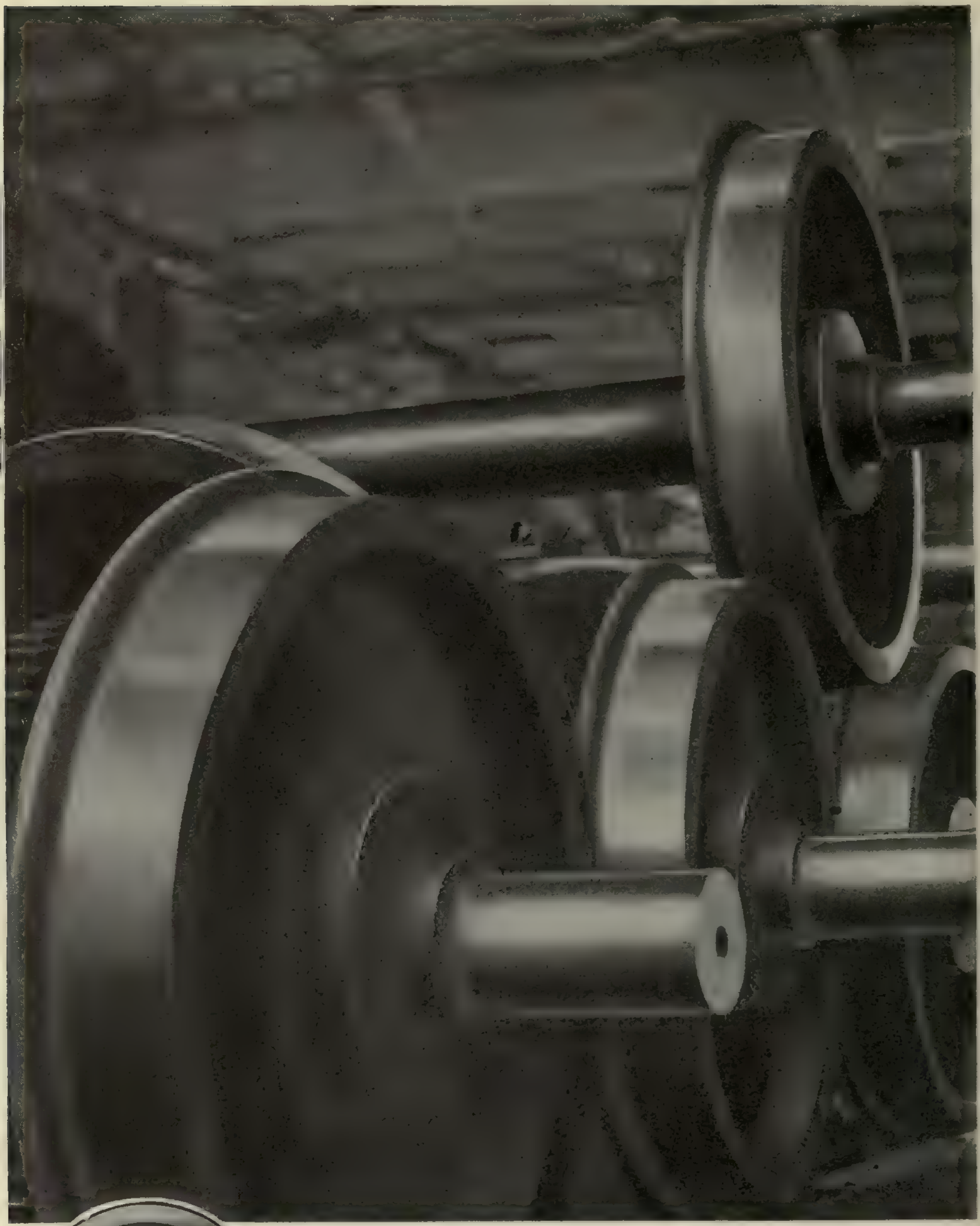
Sales Offices: Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.

Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.

*Ask the nearest
Lorain Sales Office
for Quotation*

LORAIN



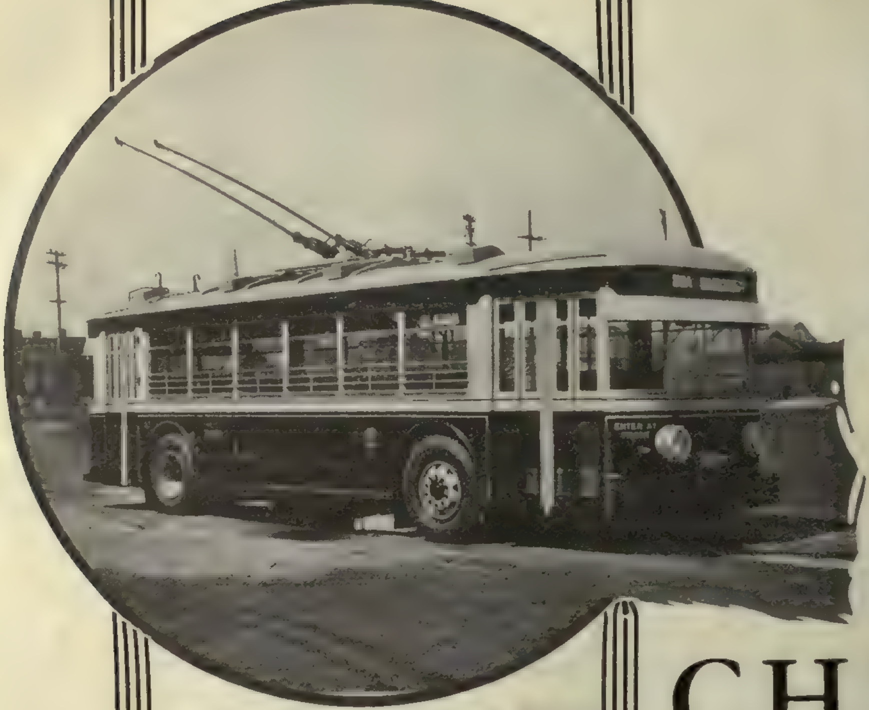
"Standard 'QT'" Wheels

"Standard" Quenched and Tempered Wheels have demonstrated in severe service superior structural strength and wear life. Scientific heat treatment is responsible for the super-service of "QT" wheels. Use them on your service to get maximum safety and minimum operating costs.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS:
BURNHAM, PENNA.

CHICAGO NEW YORK PHILADELPHIA ST. LOUIS
AKRON PORTLAND SAN FRANCISCO



Specifications—40-passenger Electric Coach.

Length over bumpers	33 ft. 0 in.
Width over guard rails	8 ft. 2½ in.
Width over side sheathing	7 ft. $11\frac{1}{16}$ in.
Height from road to top of trolley base	10 ft. 6 in.
Height from road to top of roof	9 ft. 6 in.
Height from floor to headlining at center	6 ft. 6⅞ in.
Height from floor to headlining at front	6 ft. 8⅞ in.
Height from floor to headlining at rear	6 ft. 4⅞ in.

Motors—(2) 50 hp.

Electrical Equipment—Westinghouse or General Electric optional.

Air Brakes—Westinghouse or General Electric optional.

Dynamic Braking may be installed if specified.

Seating Capacity—40.

This same design is built to seat 30 passengers, equipped with a single 50 hp. motor.

in CHICAGO

St. Louis Trolley Buses serve the outlying districts

Quick in pickup, exceptionally flexible, comfortable and easy riding, the St. Louis Trolley Buses are playing an important part in Chicago's transportation system.

Used in the outlying districts of Northwest Chicago, they have successfully solved a difficult transportation problem.

High speed and economical operation, substantial but light weight construction, low maintenance—these features of St. Louis "Quality" Trolley Buses are helping increase revenue in Chicago.

Inspect one of these Electric Coaches on display in our Booth C-312.

St. Louis Car Co.

ST. LOUIS Quality Cars MISSOURI

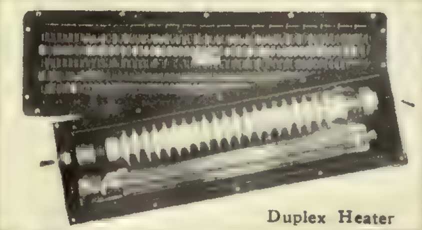
In 1889 they said:

"....electricity now does practically everything except heat the car and it is not too much to expect that problem may be solved in the future"

from Street Railway Journal - 1889

CONSOLIDATED
CAR HEATING
COMPANY

JUST three years later—in 1892—the Consolidated Car Heating Company solved the problem by inventing and building its first electric car heater. We have all come a long way since 1889, when the above question appeared in this Journal, and "Consolidated" has led the way. The modern Consolidated Equipment shown on the following page offers tangible evidence of outstanding progress.



Duplex Heater

Consolidated Heaters.

Styles and types to meet every requirement of modern electric railway and bus operation.

◆

Pneumatic Door Operator
(Differential Type)

Consolidated Pneumatic Door Operators and Treadles.

Used on the finest electric railway cars and buses.

◆

Electric
Buzzer

Consolidated Buzzers, Push Buttons and other Car Signaling Devices.

For those who want perfection in equipment details.

Thermostat

Consolidated Thermostatic Control of Car Heaters.

The accepted standard of the industry.

NEW YORK
ALBANY
CHICAGO

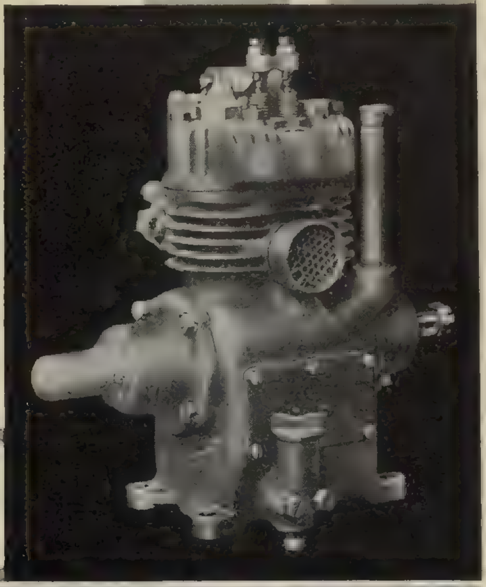
◆

CONSOLIDATED CAR-HEATING CO., INC.

Linking SAFETY TO *modern* MOTIVE POWER

Traditionally safe, Bendix-Westinghouse Automotive Air Brakes offer heavy-duty highway transportation a stopping force in keeping with modern motive power ★ How faithfully this power-to-stop meets the demands of modern transportation is evidenced by the fact that never before has the trend toward Air Brake control been so pronounced ★ Accepted as standard equipment by many of the world's most prominent manufacturers and operators, Bendix-Westinghouse Brakes are daily writing new pages in braking history through their smooth, quick, tremendously powerful action . . . Always dependable, these modern brakes bridge the gap between ordinary control and positive safety ★ The unique position Bendix-Westinghouse Brakes enjoy today is by no means accidental . . . Backed by the two greatest names in braking, today's Bendix-Westinghouse system of control represents the achievement of more than a half century's research, development and manufacture of devices which must not fail ★ Should you desire detailed information relative to the more technical advantages of Bendix-Westinghouse Brakes, an entire field organization of competent brake specialists is at your disposal, without obligation ★ Address your request to BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6295



BENDIX ★

WESTINGHOUSE

AUTOMOTIVE ★ AIR ★ BRAKES

MODERN METHODS

of Fare Collection speed operations and ensure Full Revenue thru Instantaneous Registration

An Indicator of Transportation Progress

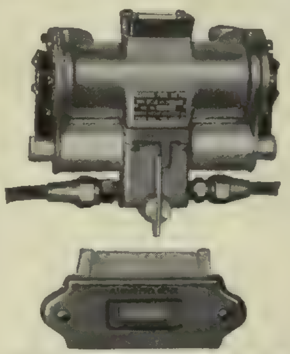
The Coin automatically and visibly records the fare on both the fare box and register.

Modern transportation *demands* instantaneous fare registration. Every improvement that tends to greater speed in passenger handling has a logical place in today's operations.

Johnson Electric Fare Boxes not only eliminate delays in fare collection but ensure full and accurate returns in revenue, the importance of which cannot be questioned.

With the modern trend toward one-man operation, some system of automatic fare collection must be adopted if such operation will be successful. Why not install the most efficient? Johnson Fare Boxes provide the fast, accurate, automatic, and instantaneous fare collection system that makes one-man operation possible and efficient.

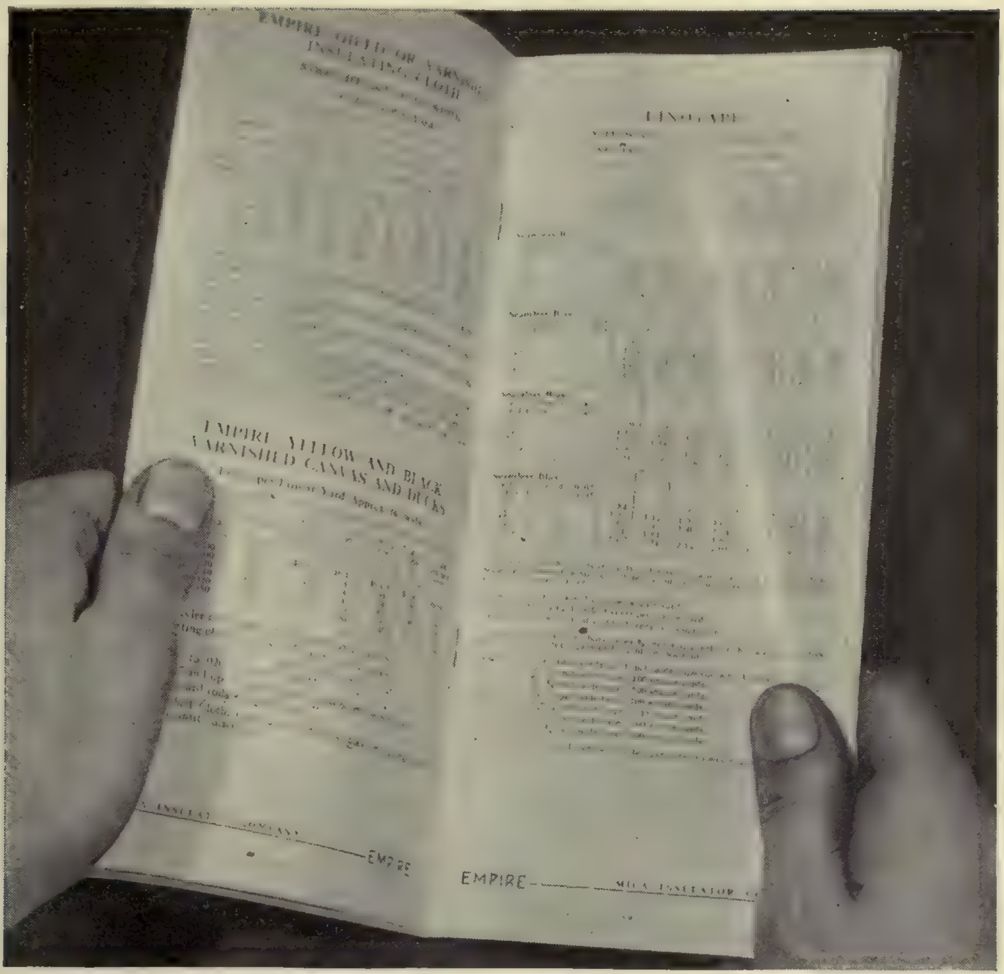
and to ensure Fuel Economy—
The Illinois Fuel Meter



Illinois Fuel Meters installed on your buses will measure actual fuel consumption in tenths of a gallon. With such accurate fuel measurements fuel wastes are readily detected.

JOHNSON FARE BOX COMPANY

4625 Ravenswood Ave., Chicago



Yours for the asking
this valuable electrical insulation data

More than 120 electrical insulations are listed in this new booklet. All the information is up-to-the-minute, including list prices and quantity discounts revised to conform with present conditions.

More comprehensive data on Lamicoid laminated Bakelite has been included in this issue. The characteristics and descriptions of many of the insulations have been amplified. In this booklet you have available at your finger tips, one source of supply for every electrical insulating material.

Thousands of electrical manufacturers and repairmen who received the first edition are receiving copies of this second issue. A copy is yours for the asking. Merely mention price list No. 91.

MICA INSULATOR COMPANY
200 VARICK ST., NEW YORK 542 SO. DEARBORN ST., CHICAGO
Sales Offices and Stocks at Cleveland, Pittsburgh, Cincinnati, San Francisco, Seattle, Birmingham, and Los Angeles, U. S. A., Montreal and Toronto, Canada. *Factories at* Schenectady, N. Y. and London, England.

PERFECT MICO INSULATIONS

PERFECT MICANITE INSULATOR

MICA INSULATOR COMPANY
Electrical Insulations
A Type For Every Purpose

PERFECT LAMICOID

PERFECT EMPIRE INSULATOR

Yes! Leather has been the leading seat covering for over 50 years - - - - -

The 50th Anniversary of the A.E.R.A. marks another milepost in the progress of transportation. But through the years leather has held its pre-eminent place as the leading material for car and bus seats. No other material has been found to give quite as complete *all around* transportation service. General Leathers made by America's largest producer, attract patronage, they provide a clean, comfortable surface, and even though soft and flexible to the touch they wear like iron. No wonder they are always found on jobs where every appointment must be just *right.* No wonder operators have repeatedly specified them on new equipment. General Leathers are furnished in all colors to blend with any interior. They are easy to wash, and stand up under all climatic conditions. Specify General Leathers on all new rolling stock or order direct for remodeling.

AMERICA'S LARGEST PRODUCERS

GENERAL LEATHER COMPANY
Newark, New Jersey

These brands:

TRANSITAN—Full Chrome
VELVELEA
GENLEACO

will be on display at Booth No. C-344, the 50th Anniversary Exhibit A.E.R.A. We shall be glad to show them to you.

Detroit Office: 414 Fisher Bldg.
West Coast Office: A. J. & J. B. Cook, Inc.,
237 Eighth St., San Francisco
Los Angeles Office: A. W. Arlin, Delta Bldg.
Canadian Office: Colonial Traders, Ltd.,
78 Williams St., Chatham, Ont.

A GREAT NEW BUS by REO

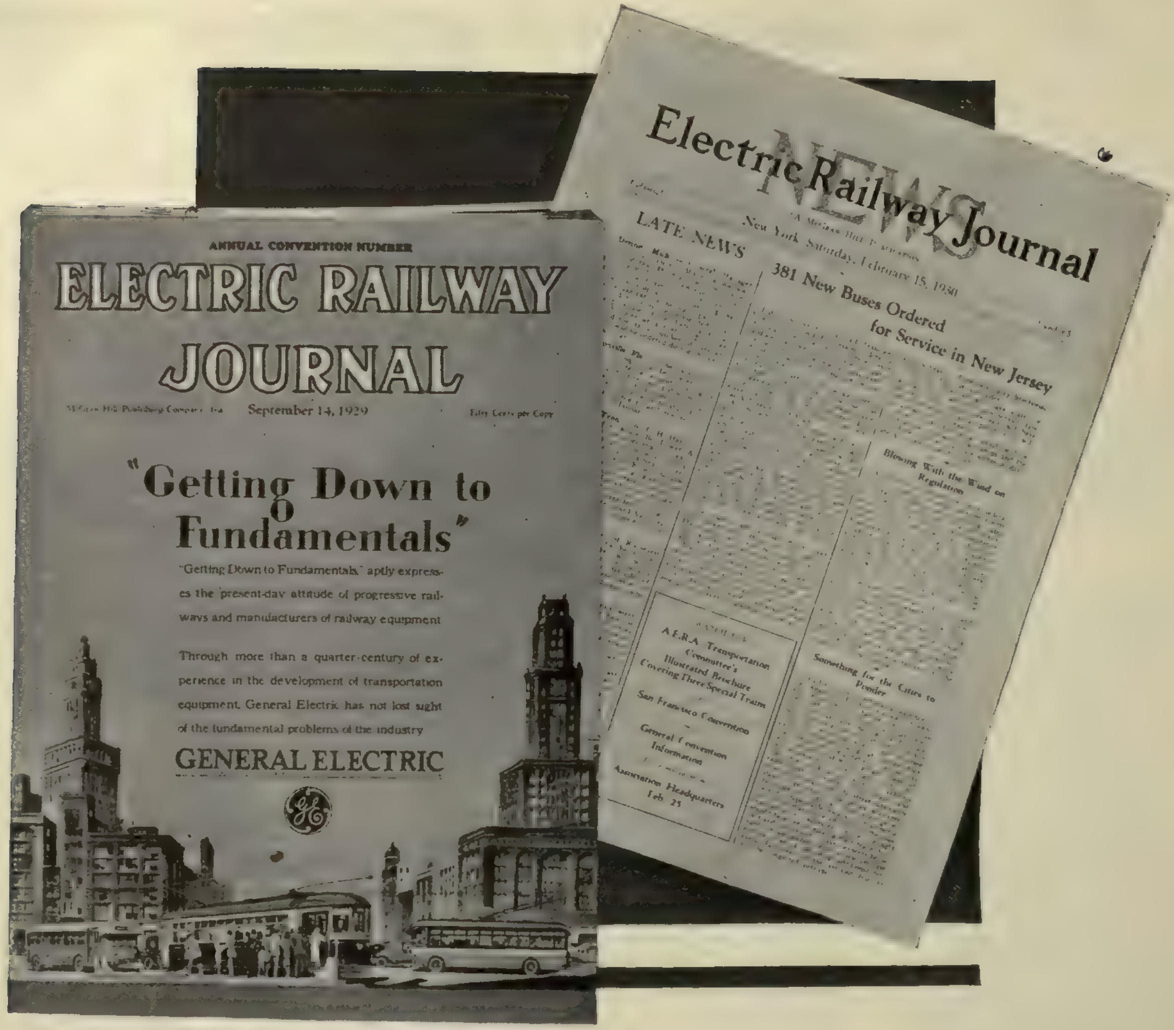
REO has a genuine surprise for those who visit Booth C-313 at the Bus Show.

It will be the first public display of an entirely new Bus by Reo — a 21-25 Passenger with two distinctive body styles.

The design and equipment of this great Bus places it far in advance of the trend and leaves no doubt as to Reo's determination to serve Bus Operators as never before.

Save time for an extra long stop at the Reo Booth.

REO MOTOR CAR COMPANY
LANSING — TORONTO



ANNUAL CONVENTION NUMBER
ELECTRIC RAILWAY JOURNAL
September 14, 1929

"Getting Down to Fundamentals"

"Getting Down to Fundamentals" aptly expresses the present-day attitude of progressive railways and manufacturers of railway equipment

Through more than a quarter-century of experience in the development of transportation equipment, General Electric has not lost sight of the fundamental problems of the industry

GENERAL ELECTRIC

Electric Railway Journal NEWS
New York, Saturday, February 15, 1930

LATE NEWS

381 New Buses Ordered for Service in New Jersey

Blowing With the Wind on Regulation

A.E.R.A. Transportation Committee's Illustrated Brochure Covering Three Special Trains

San Francisco Convention

General Convention Information

Association Headquarters Feb. 25

Something for the Cities to Ponder

You need *both*—
The Journal *plus* The News

THE monthly edition of *Electric Railway Journal* gives you comprehensive articles on changing trends, technical advances and broad problems facing the industry.

And the E.R.J. *News*—the newspaper of the field—presents terse, accurate news dispatches of fare changes . . court decisions . . financial and corporate notes . . new legislation . . association meetings . . personal notes . . all the vital news of the industry.

You need BOTH for a complete picture of the electric railway field. If you read only the monthly magazine, you miss the current news of the industry . . accurate, vital, fresh . . gathered by telegraph with newspaper speed. If you read only the *News*, you don't receive the benefit of the interpretive editorials, the authoritative articles, the maintenance and operating data of the *Electric Railway Journal* monthly magazine.

Subscription price of the E.R.J. *News* is low—only $2 domestic for the complete year's service of thirty-nine issues (it appears on thirty-nine Saturdays during the year). Canada $2.75. Foreign rate, $4 a year. Sold in combination with the monthly edition of *Electric Railway Journal* for $5 a year domestic, Canada, $5.50 and $9 foreign.

Send no money now. Simply fill out the coupon below—and mail it today! Give yourself a bird's-eye view of the entire electric railway field.

Just tear off,
fill in and
mail this
coupon today!

ELECTRIC RAILWAY JOURNAL
10th Ave. at 36th St., New York

Check one:

☐ Enter my subscription to the Electric Railway Journal NEWS and send me a bill for $2 domestic, Canada $2.75. (Foreign rate: $4 year).

☐ Enter my subscription to both the Electric Railway Journal monthly magazine and the separate NEWS service. Bill me for $5 domestic, Canada $5.50.

For every business want

CLASSIFIED ADVERTISING

EMPLOYMENT—OPPORTUNITIES—EQUIPMENT

"think SEARCHLIGHT first"

THE classified advertising pages of THE ELECTRIC RAILWAY JOURNAL offer you a direct, quick-acting, and economical way of getting into contact with the men and concerns in the electric railway industry. Based on many years' experience with classified advertising in over twenty publications, serving, in part, eight of this country's major industries, "Searchlight" Classified Advertising Service is complete in every detail.

If there is anything you need—or anything you want to sell—that can be supplied or purchased by men or concerns in the electric railway field—you can bring it to their attention through an advertisement in the "Searchlight Section" of Electric Railway Journal.

- Agencies Wanted
- Agents Wanted
- Books and Periodicals
- Business Opportunities
- Civil Service Opportunities
- Contracts Wanted
- Desk Room for Rent or Wanted
- Educational
- Employment Agencies
- Employment Service
- Foreign Business
- For Exchange
- For Rent
- For Sale
- Franchises
- Industrial Sites
- Labor Bureaus
- Miscellaneous Wants
- New Industries Wanted
- Office Space for Rent or Wanted
- Partners Wanted
- Patent Attorneys
- Patents for Sale
- Plants for Sale
- Positions Vacant
- Positions Wanted
- Property for Sale
- Representatives Wanted
- Salesmen Available
- Salesmen Wanted
- Spare Time Work Wanted
- Sub-Contracts Wanted
- Tutoring
- Used and Second Hand Machinery
- Vacation Work Wanted
- Work Wanted

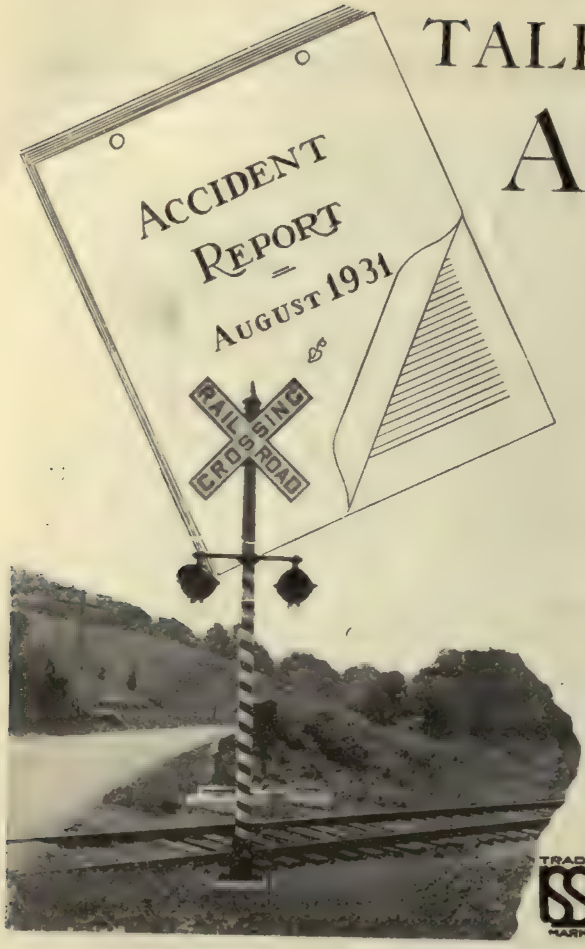
All inquiries answered promptly.

Address

SEARCHLIGHT DEPT.

Tenth Ave. at 36th St., New York City

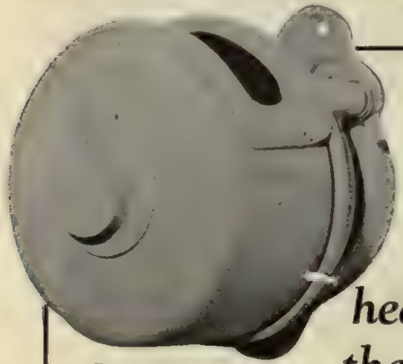
TALKING OF ACCIDENT STATISTICS



—users of "Union" Highway Crossing Signals find that accidents per 100,000 car miles have been greatly reduced, due to practically eliminating highway crossing accidents. And many of these installations have paid for themselves in a remarkably short time.

Our nearest district office will gladly give you more details. There is no obligation.

Union Switch & Signal Co.
SWISSVALE, PA.


Interurban retriever—high speed

Trolley bus retriever

As suppliers to the electric railway industry since 1904—our heartiest congratulations to the A.E.R.A. association on its golden jubilee and to the men who, over the past 50 years have so successfully carried on its work.

•

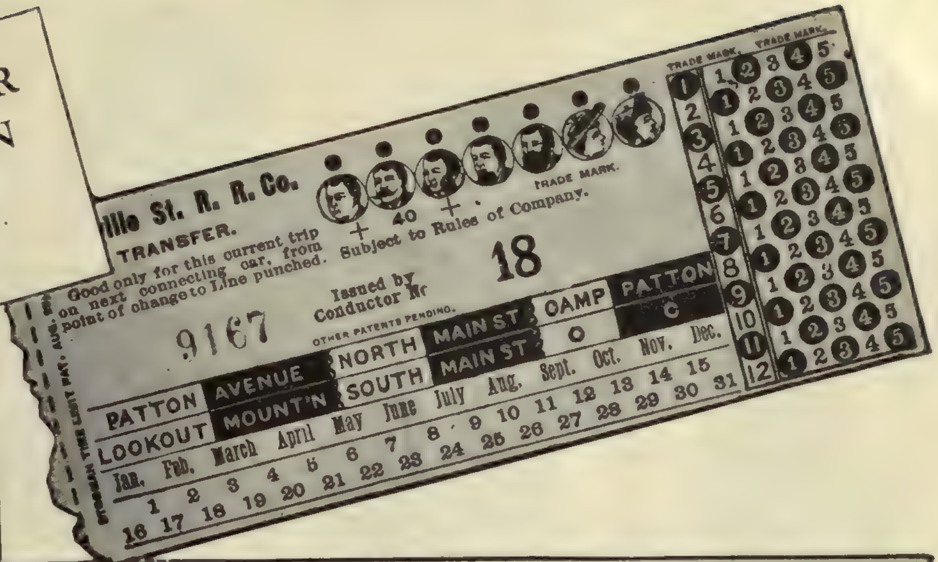
EARLL CATCHERS AND RETRIEVERS
Easy to Maintain and Operate, Simple, Light and Strong
Made by
C. I. EARLL, YORK, PA.
CANADIAN AGENTS:
Railway & Power Engineering Corp., Toronto, Ont.
IN ALL OTHER FOREIGN COUNTRIES:
International General Electric Co., Schenectady, N. Y.

City and suburban retriever

Trolley catcher

THE TRANSFER AS IT WAS IN

1896



ille St. R. R. Co. TRANSFER.

Good only for this current trip on next connecting car, from point of change to Line punched.

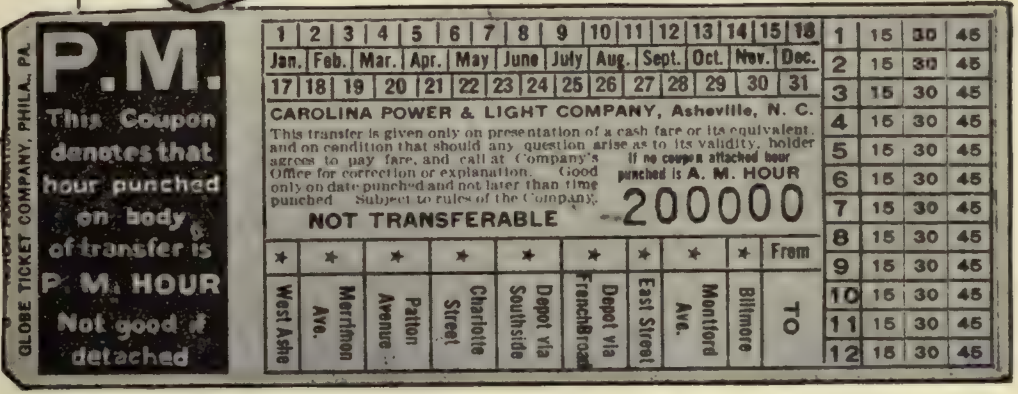
Subject to Rules of Company.

Issued by Conductor No 18

9167

. . . AND AS IT IS in

1931



P.M.

This Coupon denotes that hour punched on body of transfer is P. M. HOUR Not good if detached

GLOBE TICKET COMPANY, PHILA. PA.

CAROLINA POWER & LIGHT COMPANY, Asheville, N. C.

This transfer is given only on presentation of a cash fare or its equivalent, and on condition that should any question arise as to its validity, holder agrees to pay fare, and call at Company's Office for correction or explanation. Good only on date punched and not later than time punched. Subject to rules of the Company.

If no coupon attached hour punched is A. M. HOUR

NOT TRANSFERABLE

200000

"PUNCH, BROTHER, PUNCH WITH CARE; PUNCH IN THE PRESENCE OF THE PASSENG-AIRE."

Mark Twain saw the humor in the early transfer—and had to tell the world about it.

We even pictured the kind of whiskers the passengers wore, if any.

We're going to bring down to Atlantic City a lot of these early transfers and tickets. Better drop in and have a look at them. You may even see some old-timers *you* used. You'll get a laugh, anyway. See us at Booth E-549.

We'll be glad to "reminisce" with you—to talk over the changes that have taken place, to show you the evolution of the transfer. It makes an interesting chapter in the transportation story.

FACTORIES:

Philadelphia
Los Angeles
Boston
New York
Atlanta

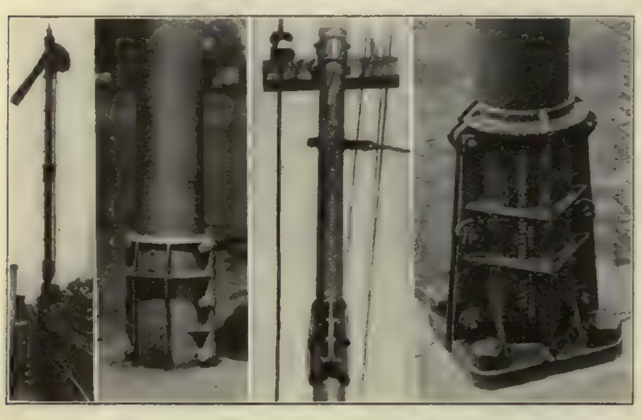
GLOBE
TICKET COMPANY
PHILADELPHIA

SALES OFFICES:

Cincinnati
Pittsburgh
Baltimore
Cleveland
St. Louis
Des Moines

"A Stitch in Time Saves Nine"

Our experience with representative street railway companies during the past two years indicates that tubular pole maintenance has been deferred to the danger point.



1. Clamps Reinforcing Semaphore Pole Corroded under Ladder Straps. 2. Ground-line Reinforcing Clamp. 3. Upper Joint Reinforcing Clamp (Reducing Type), and Crossarm Gain. 4. Williams Pole Mount.

It is better to restore corroded upper joints and ground-line sections to original strength before corrosion has gone so far as to require complete replacement.

M.I.F. Reinforcing Clamps cost less installed than other comparable methods for overcoming such deterioration.

Use Williams Pole Mounts for special jobs of mounting poles, tubular steel or wood, on rock, concrete, bridges, over vaults, sewers, etc.

Send for descriptive Sales Bulletin No. 3.

Insulated Suspension Hangers for signal conductors, etc., illustrated above, merit your consideration also—as well as our Specialties for wood pole construction such as Guy Hooks for through-bolt guying, Crossarm Gains, Suspension Clamps for aerial cable, and electrification material such as H-column Mounts, Catenary Clamps, etc.

We feature Engineering Service for Special Jobs

MALLEABLE IRON FITTINGS COMPANY

Pole Hardware Dept. [Factory and New England Sales Office] Branford, Connecticut

New York Sales Office: Thirty Church Street

Canadian Mfg. Distributor:

LINE & CABLE ACCESSORIES, Ltd., Toronto

IT ISN'T ALL FUN FOR A TROLLEY WHEEL

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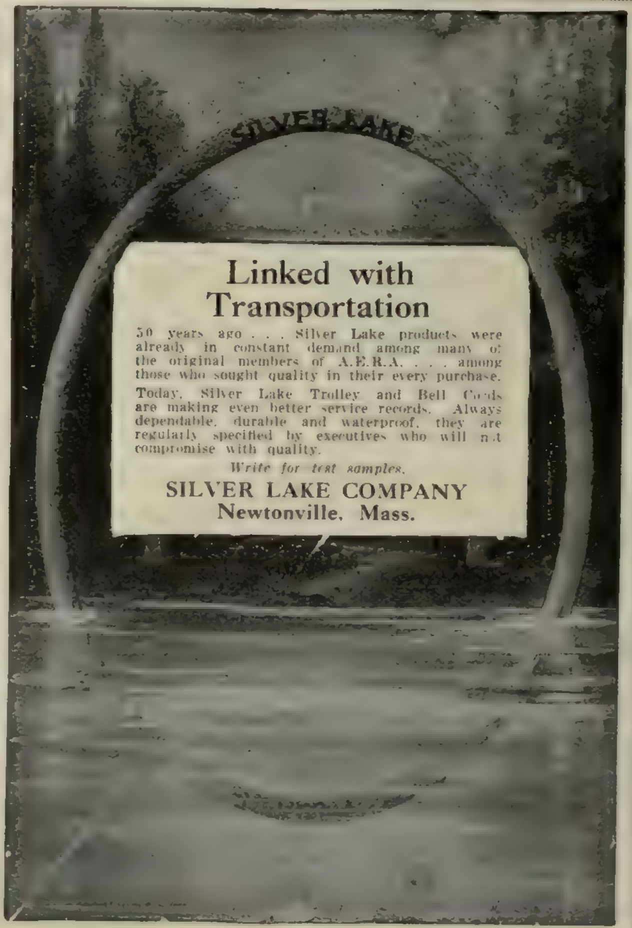

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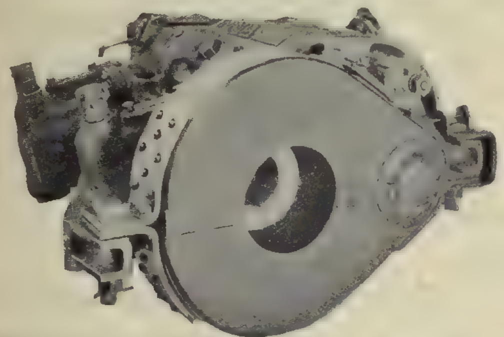

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Visit our Booth Nos. 577-579 and examine the SOUNDPROOF *features of the new* CHILLINGWORTH GEAR CASE.

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Identified with the Electric Traction Industry for more than 50 years

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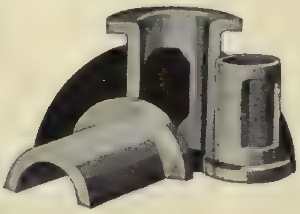

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"More-Jones" Trolley Wheels and Harps

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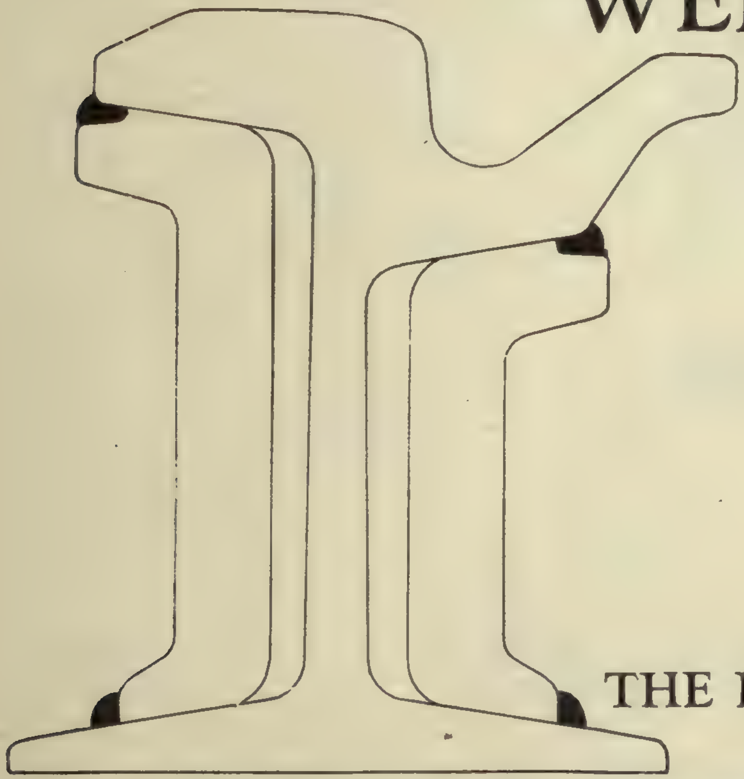
OCTOBER
CONVENTION
REPORT ISSUE

Closes October 2nd

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

ELECTRIC RAILWAY JOURNAL



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"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

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Bond Testers

The Standard of the World

Made in two types for all kinds of work.

For ordinary work we recommend the Standard Type; where the current in the rail is feeble, intermittent or entirely absent, the Type BBT. Both are covered by Bulletin G-200. Send for it.

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Electrical Measuring and Protective Apparatus

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Works BETHLEHEM, PA.

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ACCIDENTS won't happen at railway crossings guarded by Nachod Signals. Two commanding red lights, flashing on and off, and an insistent bell automatically warn of every car's approach. Full 24-hour safety, made doubly sure by a motorman's indicator. No property loss. No damage suits. Passenger good-will maintained. Let us quote you the cost of safe-guarding crossings on your lines.

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TRADE MARK REG U S PAT OFF
Industrial Cleaning Materials and Methods

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This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

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ENGINEER with broad experience of twenty years on design, construction, operating and consulting work on transportation and power systems, available for temporary or permanent engagement upon completion of present work about December 1. Last seven years with nationally known organization as transportation specialist covering investigations and reports on bus, urban, interurban and rapid transit properties. Resourceful, with initiative, tact and record of highly satisfactory and dependable service. Interview at convention arranged through Electric Railway Journal booth. PW-257, Electric Railway Journal, Tenth Avenue at 36th Street, New York.

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Or you are an individual seeking a better position—

ADVERTISE

in the Employment Columns of the

SEARCHLIGHT SECTION

FOR SALE—IMMEDIATE DELIVERY

STREET CARS

Four Cincinnati, light weight, closed type, double end, one-man, cross seat, semi-steel, Westgh. motors. Very economical in current consumption.

SHENANDOAH TRACTION COMPANY
Staunton, Va.

ROTARY CONVERTERS

1—500-kw., G.E. Synchronous Rotary Converter, full automatic, Type HC-10-500-720, Form P, 60 cy., 770 amps., 650 volts, 720 r.p.m., 6 ph. non-interpole, compound wound with 2-bearing thermostats, overspeed device, oscillator and flash-over relay.

3—185-kva., G.E. Transformers, Type HR, Form RP, 60 cyc., 1 ph., PV. 23000/20700, SV. 460/307/153, 5% reactance, outdoor, oil cooled. Equipped with A.C. and D.C. automatic switching equipment.

1—1000-kw., G.E. Synchronous Rotary Converter, full automatic, 650 volts D.C., 6 ph., 60 cy., 900 r.p.m., 1,540 amps. nominal, 2,310 amps. for 2 hrs. at 55° cont. rise, compound wound, interpole.

3—350-kva., G.E. Outdoor Transformers, 350 kva. nominal, 528 kva. 2 hrs. 60° cont. rise, reactance 1%, approx. voltage 24000/485, primary taps 24000/23400/22800/22200/21600. Equipped with A.C. and D.C. automatic switching equipment.

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1—500-kw., G.E. synchronous, continuous current Generator, Type MPC, Class 4-500-720, Form H, 833 amps., 720 r.p.m., 600 volts.

1—G.E. Synchronous Motor, .8 power factor, Type ATI, Class 10-700-720, Form C, 720 hp., 720 r.p.m., 4,400 volts, 92 amps., 60 cy.

1—Exciter, continuous current, Type MP, Class 6-8-720, Form A, 64 amps, 720 r.p.m. 125 volts. Fully equipped with A.C. and D.C. panels.

WATTHOUR METERS 600 VOLTS

Switchboard Type

16—G.E. Type CS, 1200 amp., 2 wire, D.C.
13—G.E. Type G3, 4000 amp., 2 wire, D.C.
15—G.E. Type G3, 2000 amp., 2 wire, D.C.

MOTOR GENERATORS

1—1000-kw., G.E. Motor Generator:

1—G.E. Generator, D.C. cont. current, No. 349375, Type MPC, Class 10-1000-514, Form L, 3640 amp., 514 r.p.m., 275 volts full load.

1—30-kw. Exciter, D.C., No. 1357710, Type EC8-6-30-514, Form A, 240 amps., 514 r.p.m., 125 volts full load, cont. 50° C. rise.

1—1,440-hp. G.E. Synchronous Motor, Type ATI, Class 14-1120-514, Form C, 514 r.p.m., 4,600 volts, 142 amps., 60 cy., No. 413969.

Fully equipped with A.C. and D.C. Switchboard.

TRANSFORMERS

12—350-kva., General Electric, Outdoor Transformers, 350 kva. nominal, 528 kva. 2 hrs. 60° cont. rise, reactance 1%, approx. voltage 24000/485, primary taps 24000/23400/22800/22200/21600.

OIL CIRCUIT BREAKERS

4—FHK-130-24B, G.E. Oil Circuit Breakers, Indoor, 600 amps., 25,000 volts, TPST, equipped with motor operating mech. 70 to 125 volts D.C., interrupting capacity 19300 amps. at 2 o.c.o.

2—FHKO-230-24B, G.E. Oil Circuit Breakers Indoor, 600 amp., 25,000 volts, TPST, equipped with motor operating mech. 70 to 125 volts D.C., interrupting capacity 19,300 amps. at 2 o.c.o.

5—FHKO-136, G.E. Oil Circuit Breakers, outdoor, 400 amp., 37,000 volts, TPST, equipped with A.C. solenoid, interrupting capacity, 25,000 volts, 3,300 amps., 30,000 volts, 2,600 amps.; 37,000 volts, 2,000 amps.

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WE BUY RAILWAYS IN THEIR ENTIRETY!

Anything from a single car or motor to a complete operating system. Dismantling track and trolley is a job that should be done by experienced men. Let us relieve you of your dismantling problems —We pay highest market prices.

From our past purchases we are in a position to furnish some very desirable equipment. Economy is a big factor today. Listed here are only some of our equipment—Write, telling us your needs.

For Sale

- **Modern light-weight double truck cars**
- **Birney single truck cars**
- **Freight cars**
- **Line cars**
- **300 kw. Interpole 25 cycle rotary converter**
- **300 kw. 60 cycle rotary converter**
- **Cleveland Fare Boxes**
- **K-36-J Controllers**

H. E. SALZBERG CO., Inc.

225 Broadway
Established 1898
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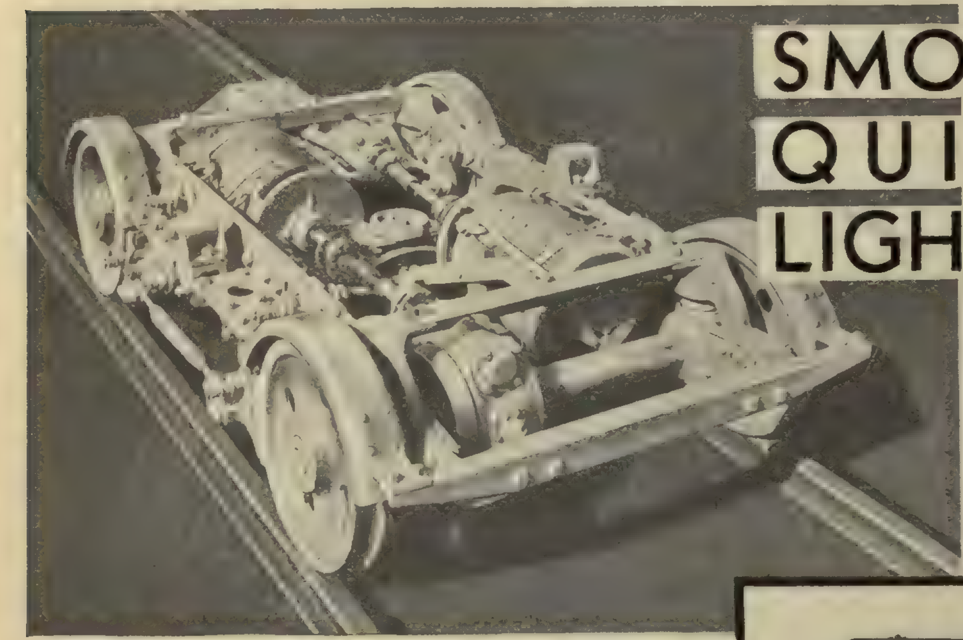
Capitalize the Advantages of Worm-Drive Trucks for Trolley Cars



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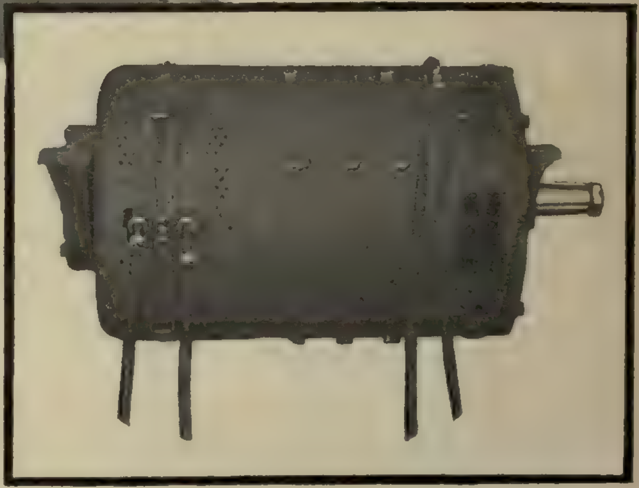
QUIETNESS
LIGHT WEIGHT



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330-172

GENERAL ELECTRIC

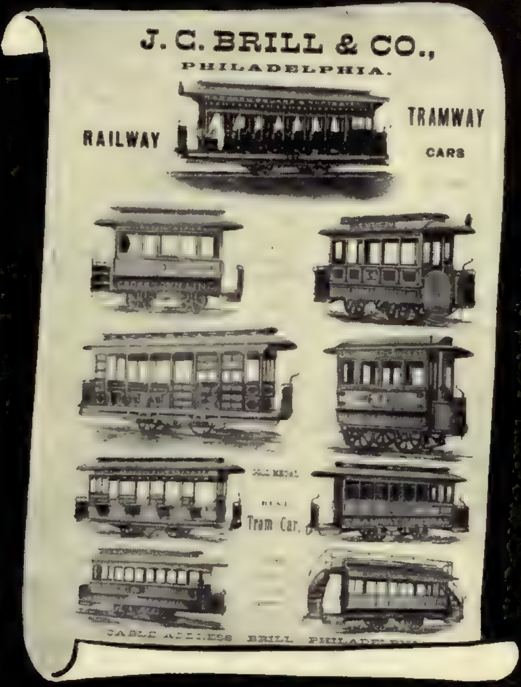
TRANSPORTATION EQUIPMENT

½ CENTURY AGO

THESE WERE MODERN CARS

BRILL

50th Anniversary A.E.R.A.
100th Anniversary of Street Car



J. C. BRILL & CO.,
PHILADELPHIA.

RAILWAY

TRAMWAY
CARS

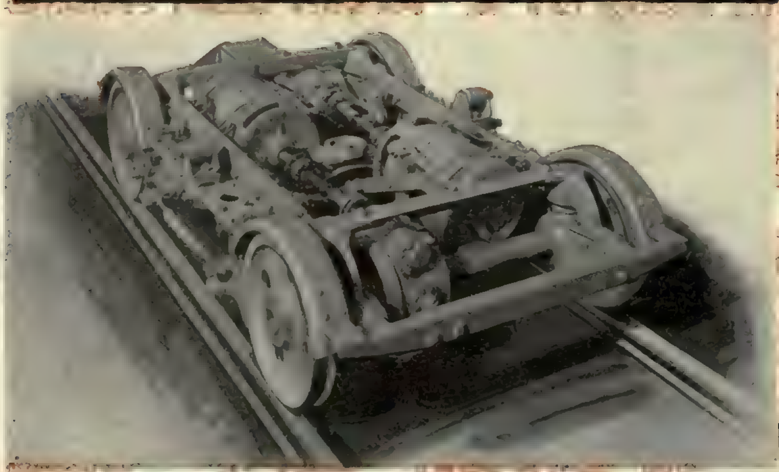
Tram Car.

Brill advertisement in first issue of first street railway trade paper.

BUT IN 1931 – IT TAKES A CAR LIKE THIS TO FURNISH – *MODERN TRANSPORTATION*

TODAY *NEW*

BRILL ELECTRIC CARS - TRUCKS



90-E TRUCK

WORM-DRIVE

RESEARCH – THEN *SPEED* AND POWER SAVING

Extensive preliminary tests resulted in the stream line design of the Philadelphia & Western High-Speed Car exhibited on the plaza. Elimination of wind resistance means increased speed as well as lower power costs.

A LIGHT-WEIGHT TRUCK

Quiet operation, smooth and comfortable riding, low unsprung weight, light-weight high-speed motors, inside hung, with worm-drive axles and inside type frames are the outstanding features of this new truck.

Exhibited in spaces C-315 & C-316

BOUND BY
HNM